CHEMICAL & METALLURGICAL ENGINEERING

USED TO MAKE

FACTS AND FIGURES OF THE PROCESS INDUSTRIES

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14th ANNUAL REVIEW NUMBER

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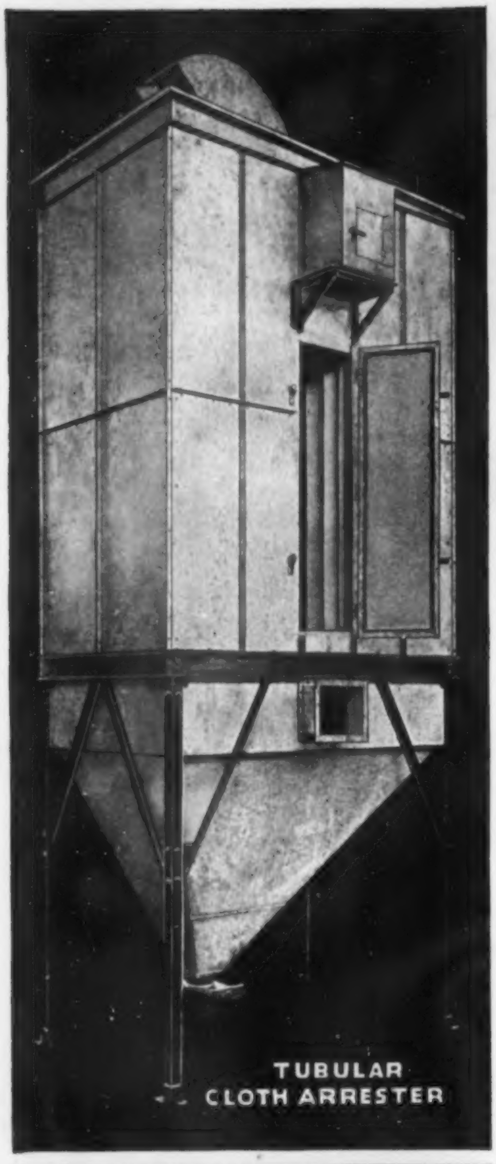

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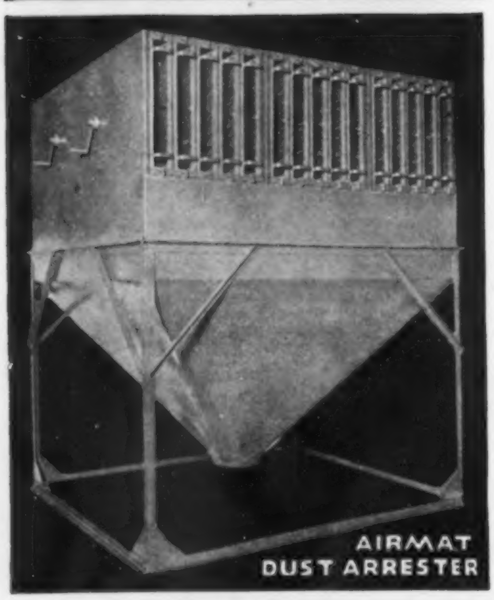

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CHEMICAL
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S. D. KIRKPATRICK, Editor

February, 1937

Chemicals—

Common Denominator of Industrial Progress...

A DISTINGUISHED PERKIN MEDALLIST once remarked that the progressiveness of an industry could be measured by its consumption of synthetic organic chemicals. He contrasted the rapidly advancing technology of the automobile with the ponderous and faltering technique of the railroads, — then an industry that had not yet awakened to its chemical opportunities. Likewise he saw in housing and home construction, and in textiles as well, a certain shortsightedness in failing to accept new chemical tools and materials. Fortunately, many of the changes the medallist envisioned but a few years ago have already taken place and in striking confirmation of his theory, most of these advances have resulted from the use of chemicals and of chemical engineering processes.

But as these old industries are taking on new life through the stimulating effect of creative chemistry, we should not overlook the less spectacular rôle of chemicals in other fields. They are so basic to our progress in process industries that their contribution is taken for granted. They are but a part of the whole complicated and interdependent structure we call modern industry. It takes an automobile strike to bring home the fact that alkali and alcohol are both essential raw materials for the motor-maker. That without glass and lacquer, plastics and rubber, whole industries are at a standstill. That without chlorine disinfectants, water-borne disease adds a costly toll of life to the astounding property damage in flooded areas.

Chemicals are often the least expensive of the raw materials that enter into a manufactured product. A few cents, for example, would more than cover the cost of the dyestuff in your clothes or the tanning materials in your shoes. Yet without these chemicals, the cloth or leather would have little value. To this extent, then, chemicals are a *least* common denominator for many industrial products. But in a broader sense they are the common bond of inter-relation that ties together the mutual interests of two great groups of chemical-producing and chemical-consuming industries.

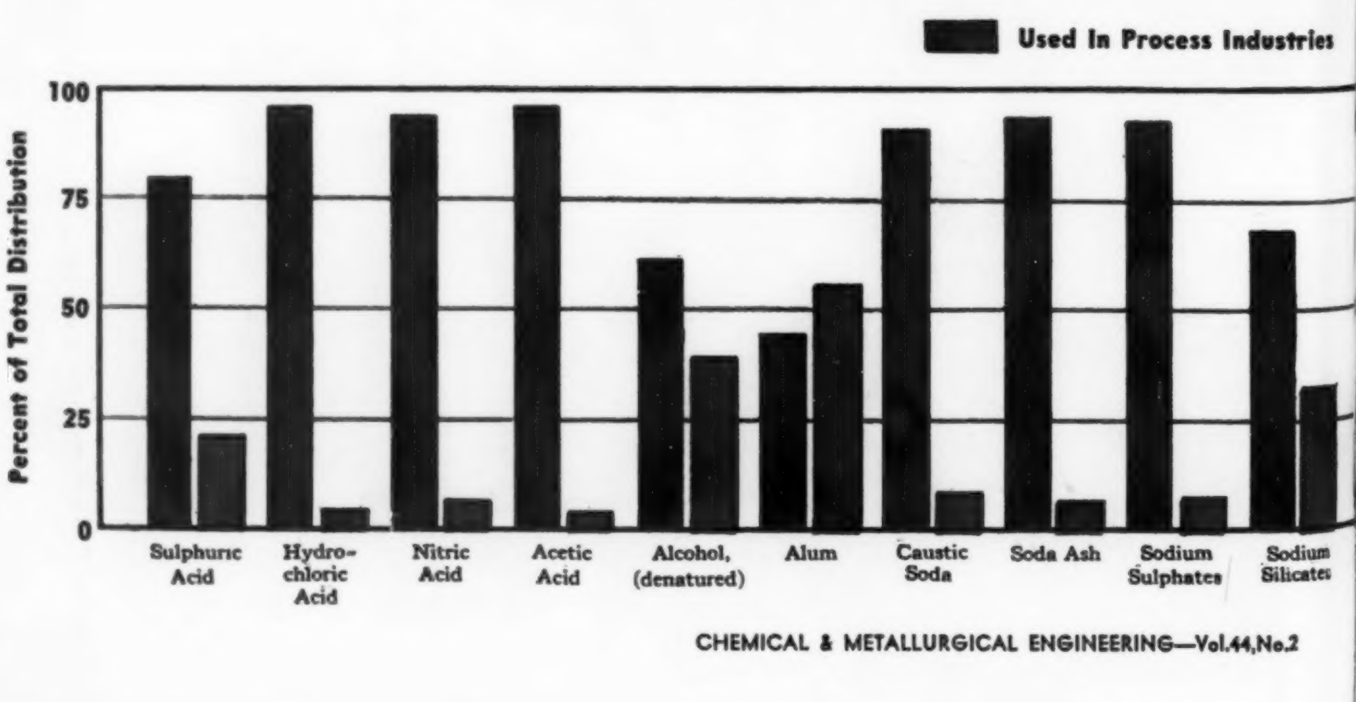
This common interest in chemicals holds most promise for our future advance. The more we know about their production and distribution, their economics and technology, the better we can make and use chemicals profitably in our plants. The closer we can follow the trends in their development and adopt the results of research to our own problems, the surer we are that our progress is in the right direction. This is the lesson we see all around us.

So this Fourteenth Annual Review and Statistical Number of *Chem. & Met.* is concerned primarily with one vital subject — Chemicals. To show where they come from and where they go, to trace the trends in the distribution of chemical raw materials, to appraise the economic factors affecting their supply and demand—that was our very difficult editorial assignment. What we have accomplished is but a start toward a better understanding of this least common denominator of our industrial progress.

Process Industries *Consume* most Chemicals

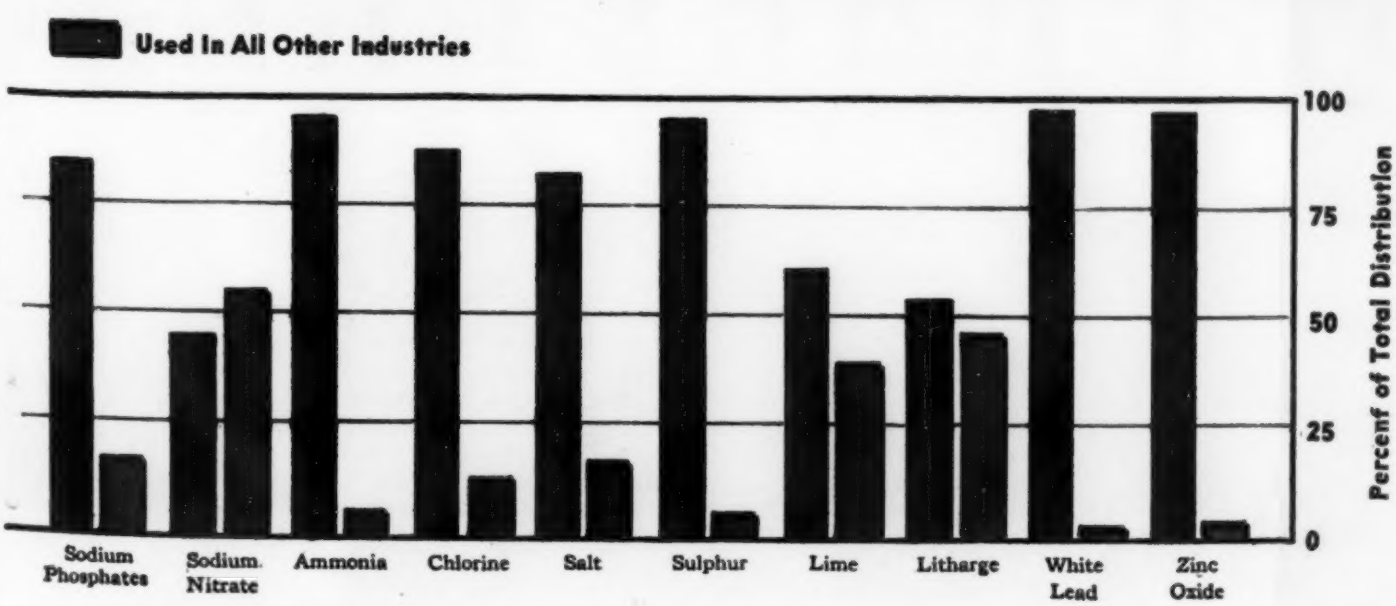
ESTIMATED DOMESTIC DISTRIBUTION

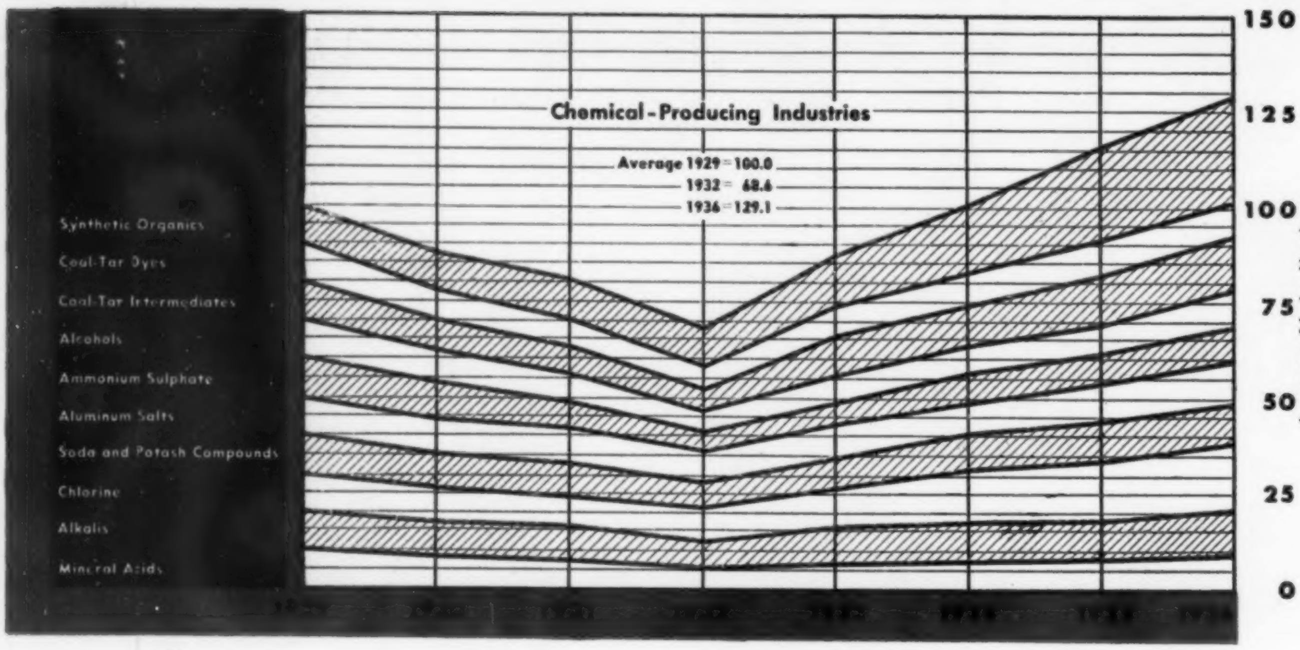
Consuming Industries	Sulphuric Acid	Hydrochloric Acid	Nitric Acid	Acetic Acid	Oxalic Acid	Alcohol, (denatured)
Units	Short Tons 50 deg.	Short Tons 100%	Short Tons 100%	Short Tons 100%	Short Tons	Wine Ga Fiscal Ye 1935
Heavy Chemicals	723,000	20,000	10,000	10,000	200	
Dyes and Organic Chemicals	210,000	22,500	30,000	41,500	300	35,500,00
Plastics and Resins	8,500			3,500		5,500,00
Wood Chem. and Naval Stores	7,500	500				
Glass and Ceramics	500	1,500				
Manufactured Gas and Coke	625,000					
Explosives	175,000		100,000			5,000,00
Fertilizers and Insecticides	1,730,000		500			
Leather, Glue and Gelatine	17,000	16,750		4,000	200	50,00
Lime and Cement						
Oils, Fats and Greases	14,000	1,000				
Paints and Pigments	400,000		2,500	2,500		7,500,00
Pulp and Paper	1,500					
Petroleum Refining	1,000,000					1,500,00
Rayon and Cellulose Film	309,000			18,000		2,000,00
Rubber Goods	22,500					
Soap and Glycerine	6,000	2,500				185,00
Sugar and Food Products	3,500	1,000		10,000		2,000,00
Textile Processing	90,000	7,500	200	10,000	1,000	
Total for Process Industries	5,343,000	73,250	143,200	99,500	1,700	59,235,00
Total for Other Industries	1,382,000	1,750	10,600	3,500	3,300	37,796,07
Total Distribution	6,725,000	75,000	153,800	103,000	5,000	97,031,07



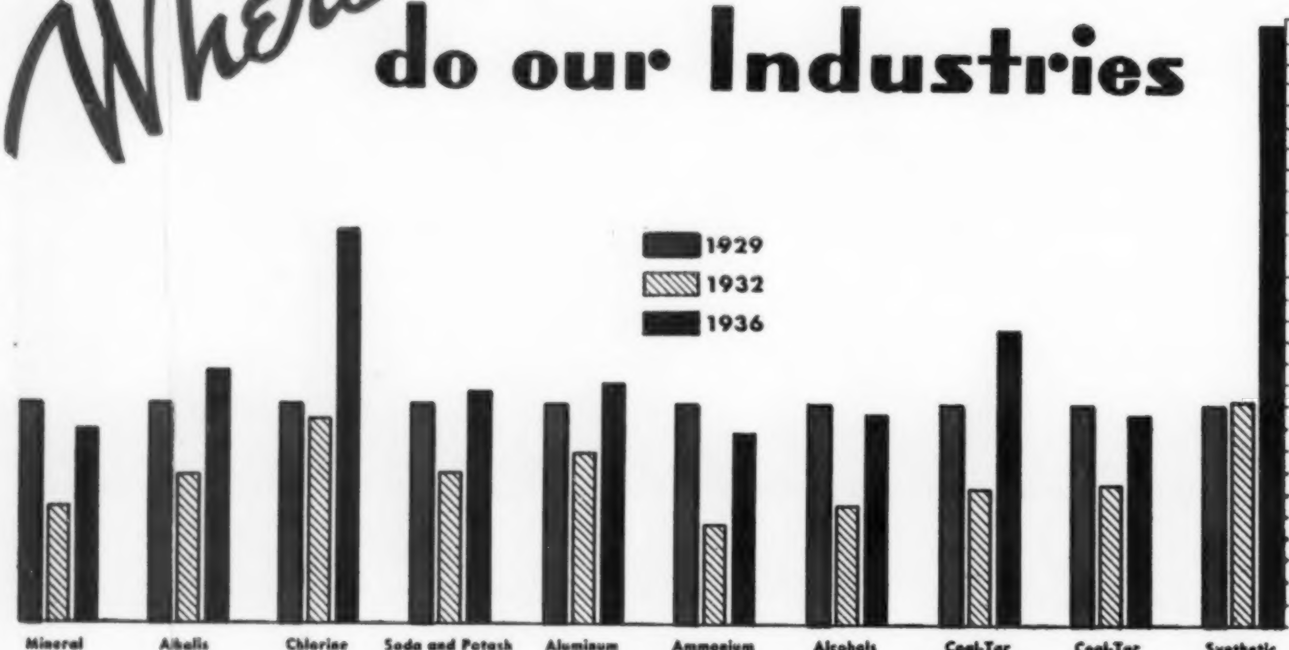
OF CHEMICAL RAW MATERIALS IN THE PROCESS INDUSTRIES

Alum	Caustic Soda	Soda Ash	Sodium Sulphates	Sodium Silicates	Sodium Phosphates	Sodium Nitrate	Ammonia	Chlorine	Salt	Sulphur	Lime	Gypsum	Litharge	White Lead	Zinc Oxide
Short Tons $Al_2(SO_4)_3$	Short Tons 76%	Short Tons 58%	Short Tons	Short Tons 40 deg.	Short Tons	Short Tons	Net Tons Nitrogen	Short Tons	Short Tons	Long Tons	Short Tons	Short Tons Calcined for Mfg.	Short Tons	Short Tons Dry and in Oil	Short Tons
15,000	70,500	500,000	10,000	2,000	10,000	20,000	102,000	45,000	4,750,000	570,000	300,000	2,000	2,000		1,000
500	75,500	200,000	10,000	1,000	2,000		4,500	80,000	207,000	65,000	17,000				750
	1,000	500					100				25,000				
		500									6,000				
250	500	700,000	41,000			500			3,000		686,000	61,000	6,750	1,834	4,028
	4,000	1,000									50,000				
	3,000	3,000		1,500		66,000	25,000			42,000	7,000				
				1,000		175,000	127,000		5,000	239,000	100,000		14,665		
500	1,500	2,500	1,000	1,000	10,000		100		350,000		123,000				
				5,000								4,600			
200	9,000	2,000							5,000						
750	1,000	1,500		2,500	1,000					4,000		1,000	7,920	91,297	54,921
117,500	40,000	80,000	225,000	285,000				145,000		204,000	344,500	2,000			
	87,000	8,000					4,000			7,000	100,000		7,870		
	160,000	2,000	5,000				400								
	11,000	2,000					200			33,000	5,000		3,170		57,770
	96,000	170,000	2,000	155,000	40,000		300		40,000		13,000				
500	500	1,000		2,000	10,000	5,000	5,000		1,200,000	4,000	19,500				
5,000	34,000	50,000	80,000	8,000	36,000		500	11,000	40,000		5,000				9,000
140,200	594,500	1,724,000	374,000	464,000	109,000	266,500	269,100	281,000	6,600,000	1,168,000	1,801,000	70,600	42,375	93,131	127,469
174,800	55,000	103,500	28,000	216,000	21,000	322,500	10,900	38,300	1,405,000	54,000	1,154,000	23,400	36,275	1,369	2,531
315,000	649,500	1,827,500	402,000	680,000	130,000	589,000	280,000	319,300	8,005,000	1,222,000	2,955,000	94,000	78,650	94,500	130,000





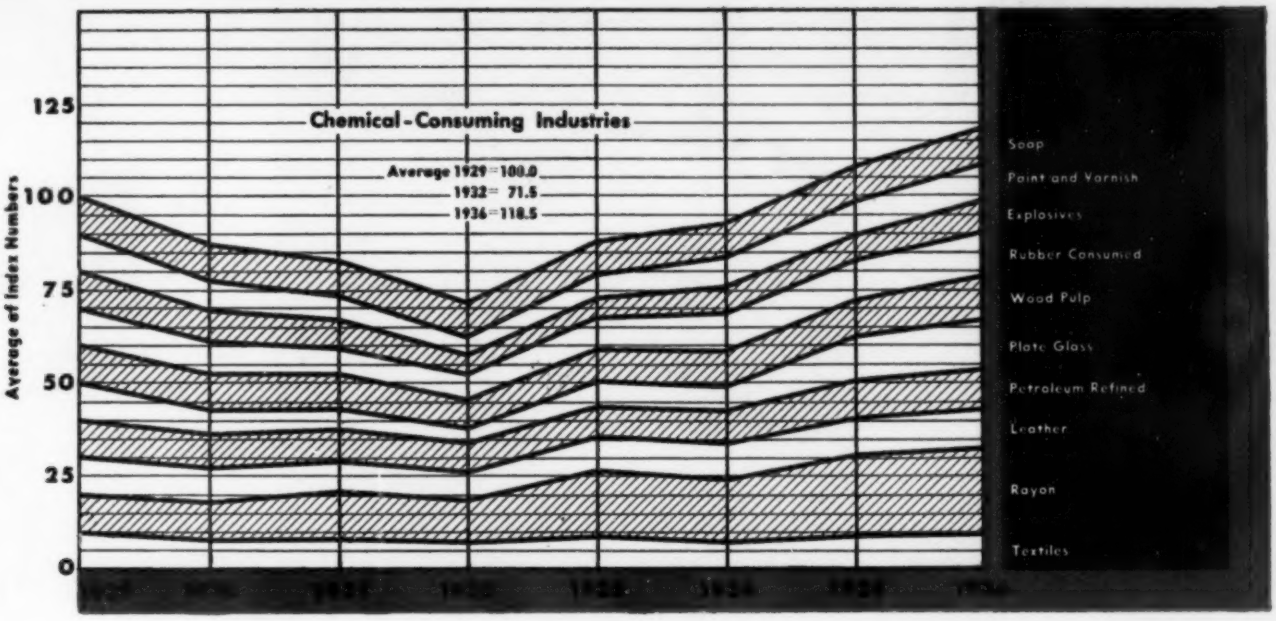
Where do our Industries



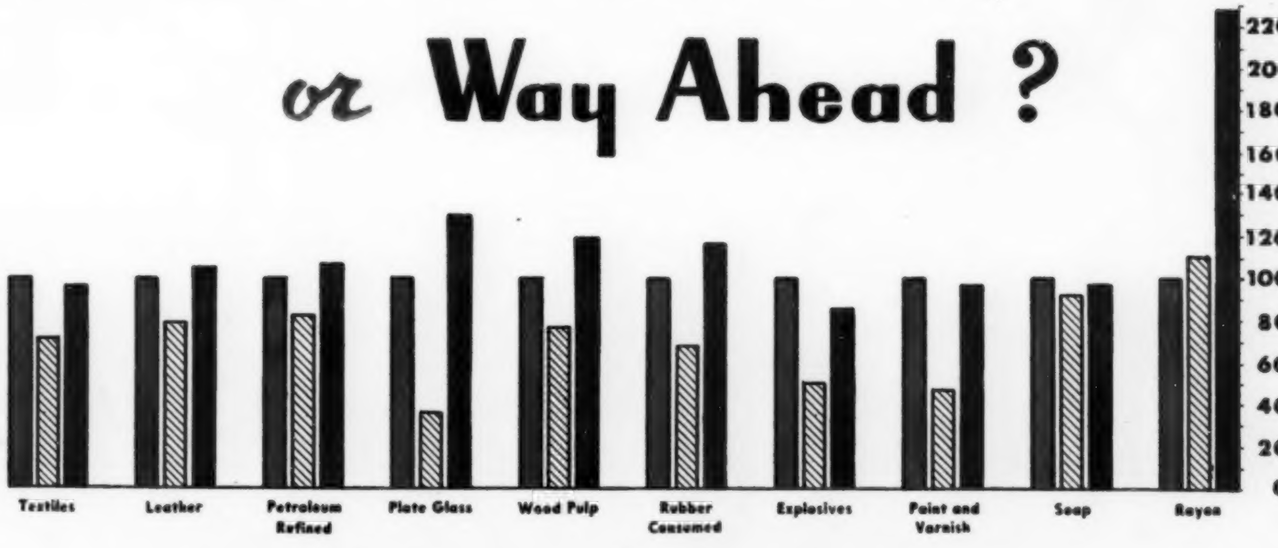
TRENDS OF ACTIVITY IN CHEMICAL-PRODUCING INDUSTRIES

Production Index Numbers — Basis 1929=100

	Mineral Acids	Alkalis	Chlorine	Alcohols	Soda and Potash Compounds	Aluminum Salts	Coal-Tar Intermediates	Coal Tar Dyes	Synthetic Organics	Ammonium Sulphate
1929	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
1930	[illegible]	[illegible]	92.98	77.98	90.00	91.87	88.65	77.62	96.32	93.15
1931	71.79	99.36	90.95	69.85	85.50	84.23	70.54	74.95	90.54	71.35
1932	52.37	67.14	92.96	54.17	69.49	77.57	61.57	63.95	101.98	46.32
1933	64.36	92.30	107.54	62.59	85.85	87.95	101.00	90.59	122.41	52.61
1934	72.13	93.30	150.76	75.43	88.16	95.96	109.79	78.34	179.06	60.05
1935	78.99	107.01	160.30	84.24	100.10	100.98	113.35	91.49	247.95	88.20
1936	89.16	114.77	189.90	96.96	104.50	109.00	135.46	95.14	277.97	85.62

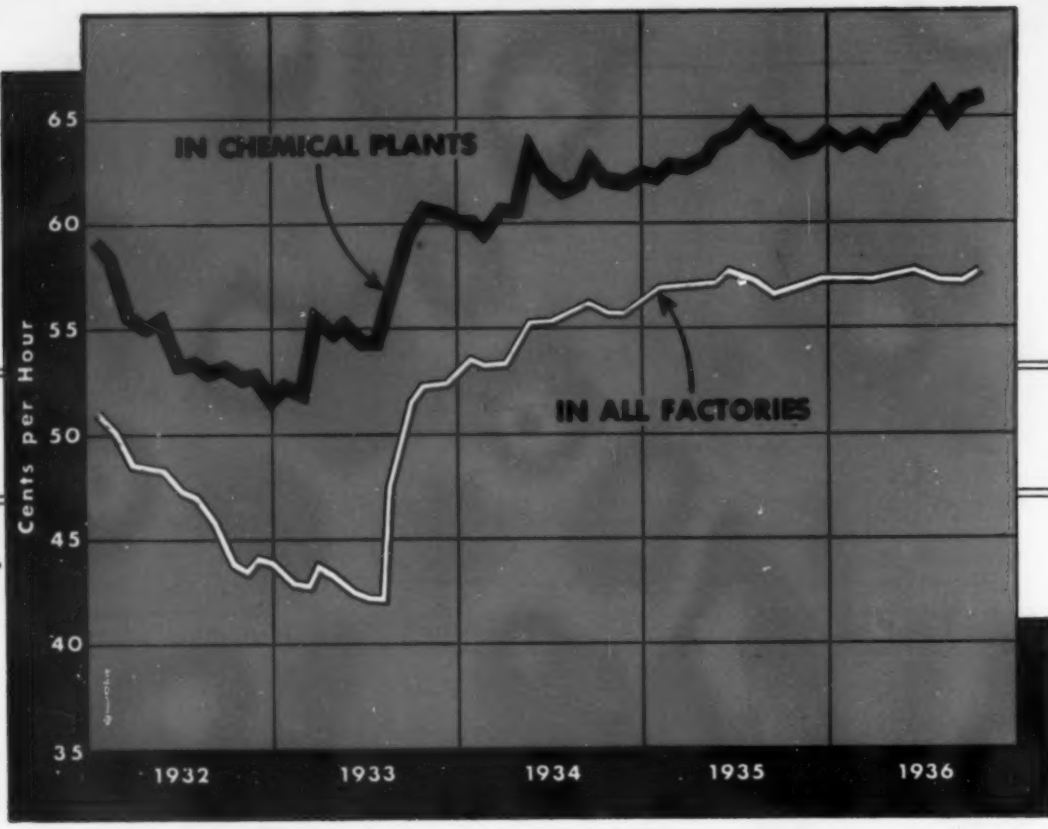


Stand ?... Back to 1929 ?
or Way Ahead ?



TRENDS OF ACTIVITY IN CHEMICAL-CONSUMING INDUSTRIES
Consumption Index Numbers — Basis 1929 = 100

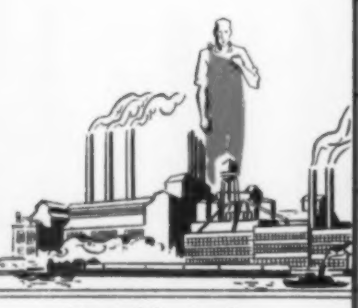
	Textiles	Rayon	Leather	Petroleum Refined	Plate Glass	Wood Pulp	Rubber Consumed	Explosives	Paint and Varnish	Soap
1929	100.00	100.00	100.0	100.00	100.00	100.0	100.00	100.00	100.0	100.0
1930	76.20	104.86	89.5	90.93	70.32	95.6	81.05	87.78	77.6	98.6
1931	79.47	124.36	87.6	86.09	57.75	89.8	73.08	[illegible]	70.4	95.8
1932	76.66	110.95	79.0	82.86	34.69	77.1	66.21	50.58	48.0	92.8
1933	98.05	175.86	92.4	87.28	58.14	89.5	83.70	57.88	61.6	87.2
1934	74.30	171.75	96.1	90.67	60.49	93.5	97.61	[illegible]	82.1	89.5
1935	92.16	211.45	103.8	97.85	119.41	100.3	104.89	70.00	88.0	[illegible]
1936	97.18	227.85	105.9	107.36	130.00	119.8	117.28	84.58	90.6	98.6



Average Hourly Earnings

Source: Department of Labor

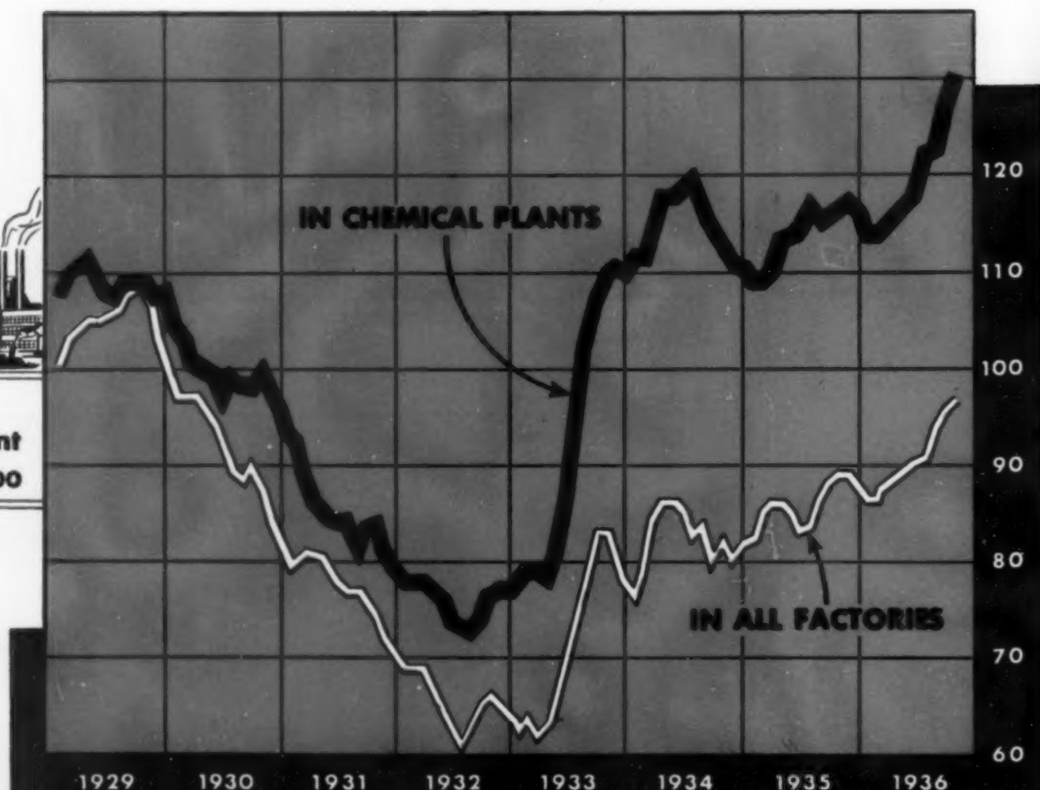
Chemical Industry *Provides* More E



Monthly Index of Factory Employment

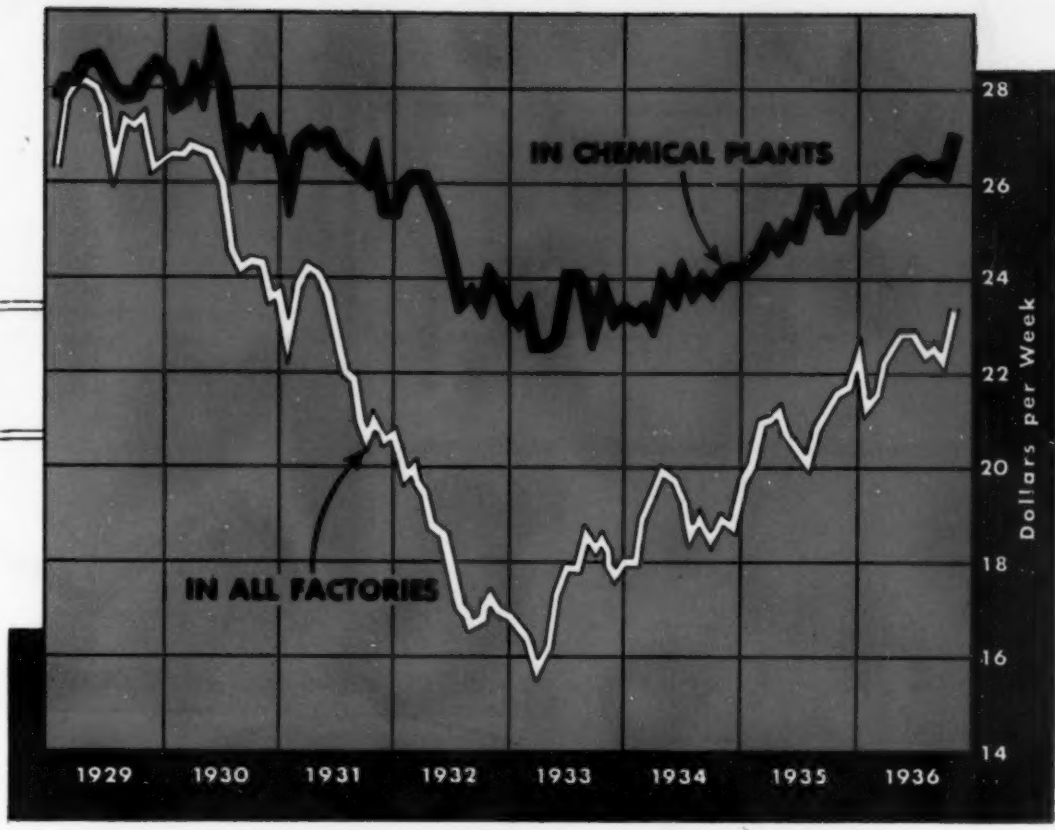
Monthly Average 1923-25=100

Source: Department of Labor

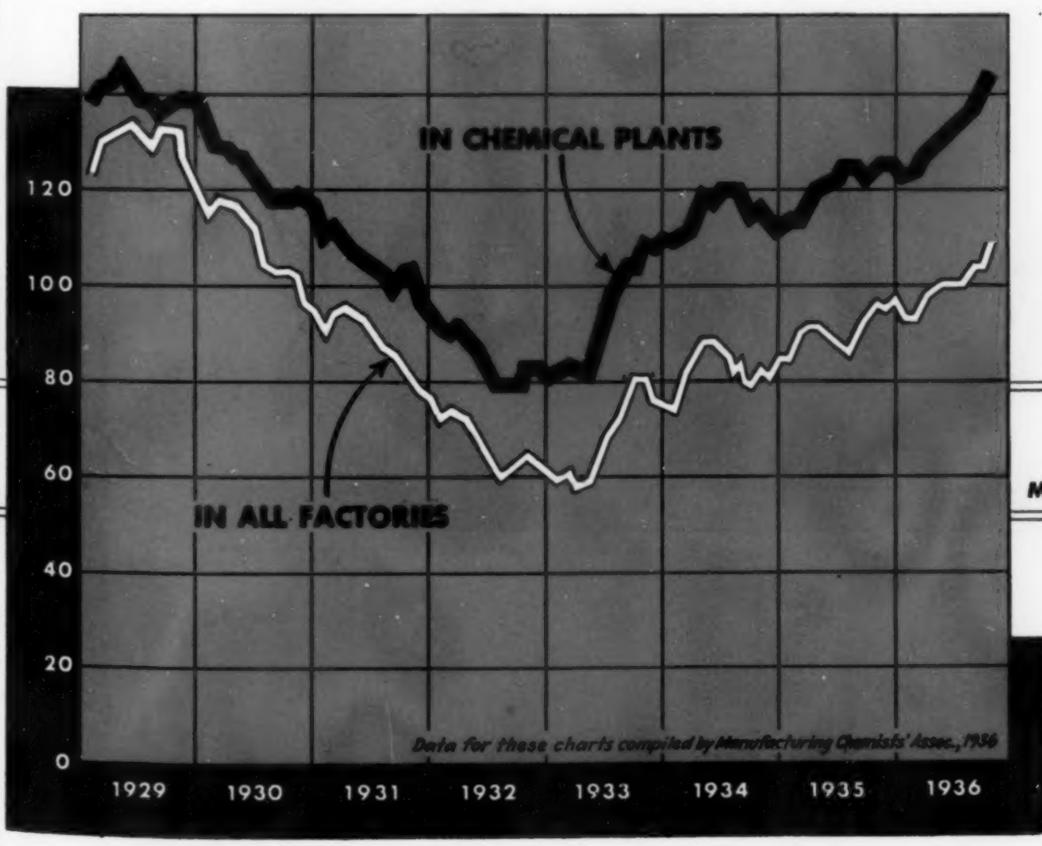


Average Weekly Earnings

Source: Department of Labor



Employment at Higher Wages

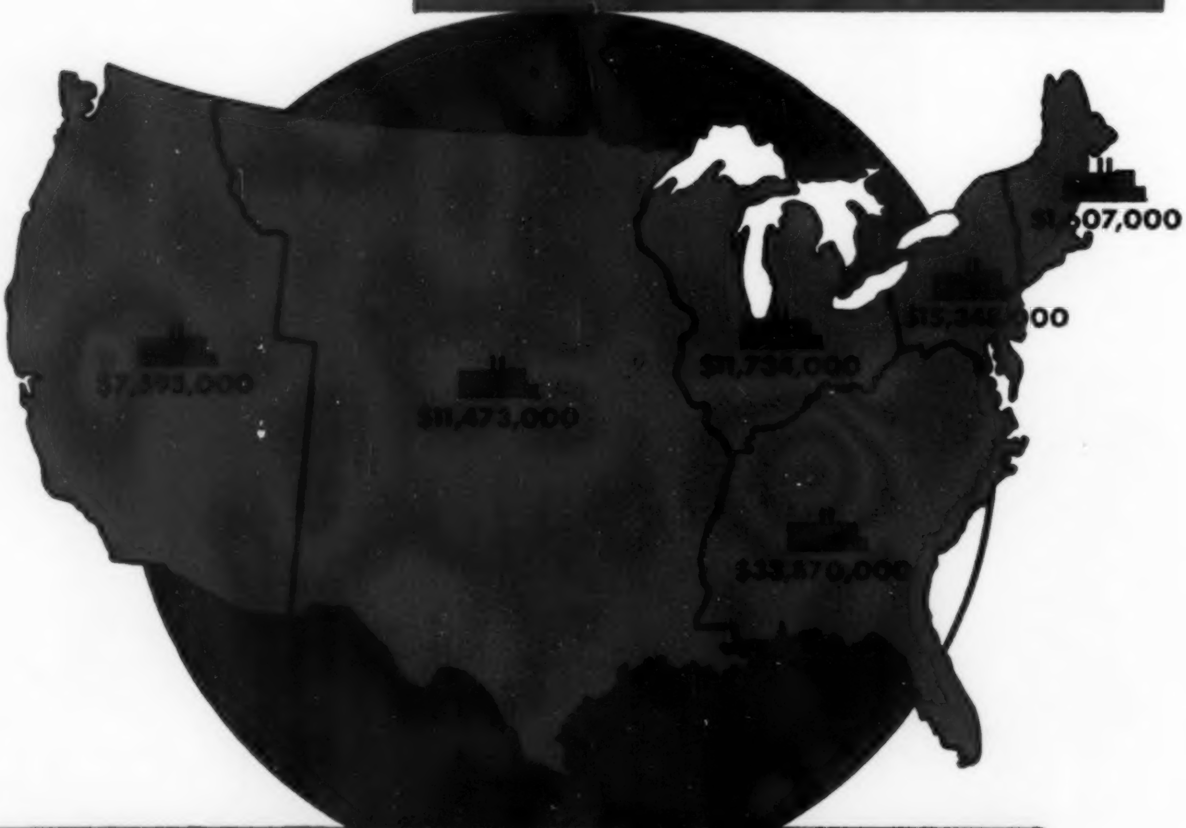


Monthly Index of Factory Payrolls

Monthly Average 1923-25=100

Source: Federal Reserve Board

Where New Plants Are Being Built in Process Industries



	1932	1933	1934	1935	1936
Railroads	$ 1,108,000	$ 3,621,000	$ 909,000	$ 712,000	$ 1,690,000
Automotive Service	9,562,000	10,288,000	5,655,000	4,173,000	5,127,000
Public Utilities & Other Pwr. Plts.	22,800,000	14,290,000	1,741,000	7,577,000	42,481,000
Process Industries (a)	19,002,000	43,203,000	21,922,000	34,655,000	81,627,000
Food Industries (b)	14,385,000	50,038,000	20,674,000	19,655,000	28,639,000
Metal Refining and Rolling	745,000	6,979,000	31,609,000	59,075,000	65,505,000
Automobile Factories	3,735,000	331,000	1,709,000	3,553,000	17,410,000
Aircraft Factories	418,000	128,000	30,000	425,000	915,000
Foundries	188,000	465,000	368,000	1,952,000	1,541,000
Machines and Machine Parts	5,220,000	2,848,000	3,404,000	10,992,000	14,560,000
Textiles (excl. Rayon)	2,047,000	2,781,000	1,431,000	2,216,000	3,421,000
Wood Industries	595,000	2,296,000	488,000	999,000	1,008,000
Refrigeration and Cold Storage Plants	613,000	490,000	500,000	278,000	209,000
Miscellaneous	12,646,000	14,618,000	14,752,000	26,118,000	45,344,000
TOTALS	$93,064,000	$152,376,000	$105,192,000	$172,380,000	$309,477,000

(a) Includes Distilleries (b) Includes Breweries and Wineries

Industry Again Becomes "COMMODITY-CONSCIOUS"

AN INTRODUCTORY EDITORIAL

RAW MATERIAL prices are rising. One of the reasons, the economist tells us, is "short-term inelasticity of supply." In other words, production of manufactured goods in many industries seems to have pushed ahead at a faster rate than may have been warranted by the available supplies of raw materials. The output of commodities of agricultural origin cannot be expanded overnight, and speculators in London and elsewhere have used this to their advantage in the cotton, rubber and other commodity markets. The supplies of a number of industrial raw materials, which might otherwise have been rapidly expanded, have been adversely affected by labor disturbances, either in the plants of production or in connection with shipping facilities. Restrictions and regulations resulting from the Robinson-Patman and the Walsh-Healey laws have forced revision of price structures in several industries. New taxes and wage increases must be absorbed or passed on to the consumer. Is it any wonder the chemical manufacturer asks: "What's the answer"?

To sample business opinions on these and related subjects, the Guaranty Trust Co. of New York recently addressed an inquiry to a group of representative concerns engaged in the production and distribution of foods, textiles, leather, paper, chemicals, fertilizers, metals and machinery. Of 51 responses, 47 concerns anticipate the necessity of raising their price levels in the near future. Thirty-six said that this would be necessary because of a rise in price of raw materials. Of 33 replies to a third question, 28 indicated an expectation of higher labor costs. When asked "Is there likely to be a shortage of inventory in your raw material markets?" — 13 stated unqualifiedly that there will be such a shortage. Twelve look for a shortage in some goods, but not in others. Eleven could foresee no shortage. Speculative tendencies were noted by ten concerns of which six admitted that there had been some anticipatory buying in their industries. The final question: "Do you anticipate stability as regards labor problems?" — revealed 18 firms expecting serious difficulties, while 14 believed that there would be no disturbances or that they will not drastically affect their business.

The weight of opinion revealed by this sampling process seems to be that a general rise in values is in prospect, including wages as well as prices of raw materials and manufactured products. Labor difficulties, while threatening to spread from automobiles to steel and perhaps later to textiles and chemicals, are not yet sufficiently serious to stay the momentum of business recovery. So the more immediate problem seems to be concerned with commodities — with supplies of raw materials.

In the process industries much of that problem centers around the chemical raw materials that are shared by so many different markets. Unfortunately accurate and timely statistics are available on only a very limited number of chemicals. For the great majority of products — even those as basically important as chlorine and the alkalis, one must wait for the biennial census or work with trade estimates that might sometimes be better called "guesstimates." Accordingly the editors of *Chem. & Met.* have decided to tackle the problem of commodities, to see what could be done about charting the input and output of chemicals in the different process industries. Census data were used wherever available but where such information had not yet been released, trade estimates were studied and brought up to date or new estimates made and checked wherever possible by both producers and consumers of chemicals.

On the pages that follow it will be observed that each of the larger groups of process industries is made the subject of a commodity study. In the heading for each section an attempt has been made to show the quantities of the more important raw materials which were used to make the finished products of that industry. All of the figures refer to 1935 operations — the most recent year for which any reliable information could be obtained. Following these "Materials Flowsheets" are brief reviews and analyses of commodity trends within the industry or group under discussion, with primary consideration given to the factors affecting price structure, supply and demand.

The whole study, while certainly not the last word in completeness or refinement, is the first comprehensive attempt to view these process industries purely from the commodity or raw materials viewpoint.

PULP AND PAPER INDUSTRY

USED TO MAKE

117,500 Tons	Alum
40,000 Tons	Caustic Soda
18,000 Tons	Casein size
320,000 Tons	China Clay
146,000 Tons	Chlorine
344,500 Tons	Lime
188,090 Tons	Limestone
88,000 Tons	Rosin
204,000 Tons	Sulphur
283,600 Tons	Silic. of Soda
225,000 Tons	Salt Cake
7,628,274 Cords	Wood
80,000 Tons	Soda Ash

PULP	
Mechanical	1,355,819 Tons
Sulphite	1,594,748 Tons
Sulphate	1,467,749 Tons
Soda	489,238 Tons
Screenings	36,672 Tons
Other	106,630 Tons
PAPER	
Newsprint	939,000 Tons
Book	1,194,000 Tons
Writing	480,500 Tons
Wrapping	1,570,000 Tons
Tissue	425,000 Tons
Building	426,000 Tons
Board	4,693,000 Tons

Sources: U. S. Census of Manufactures, 1935, Chem. & Met., and paper trade estimates

THE OUTSTANDING TREND in the pulp and paper industry in this country is the increase in the production of kraft or sulphate pulp from a beginning about 25 years ago to the point where it is surpassing all other varieties of pulp and is headed for even greater heights. Sulphite pulp long enjoyed an enviable position among chemical pulps. It reached a production peak of 1,688,707 tons in 1929 and then gave way to the forces of the business depression. On the other hand sulphate pulp which had reached 910,888 tons in 1929 continued its climb to 1,467,749 tons in 1935 and an estimate places last year's production at 1,802,000 tons. There is little doubt that the current year will witness an even greater production for there are under construction ten new mills in the Southern states that will add about 1,225,000 tons per year of kraft pulp capacity.

Translated into chemical consumption this great expansion in the sulphate industry means a vastly increased demand for salt cake, lime, chlorine and other chemicals. The salt cake consumption will be in the neighborhood of 325,000 tons and the lime about 200,000 tons per year.

From the standpoint of chlorine consumption this trend in the increased production of sulphate is extremely important. While only 5 per cent of the weight of pulp is required to bleach sulphite approximately 3 times that figure is required to bleach sulphate.

At least one southern kraft mill has been producing bleached pulp for over ten years but only recently has bleaching become general practice. As Clark C. Heritage (*Chem. & Met. Eng.*, Vol. 44, page 9, 1937) has said, "The large scale production of bleached sulphate pulp of outstanding strength and color has been made possible by the introduction of so-called multi-stage bleaching processes involving the use of chlorine both as such and as hypochlorite. Bleached sulphate has not until recently been considered as competitive with bleached sulphite because of the color superiority of the latter. This gap is being rapidly closed and the trend is certainly apparent that bleached sulphate and bleached sulphite will be competitive for many grades of paper. Against sulphate of greater strength and equal color, the utility of sulphite will perhaps hinge on other property combinations. A further development of the same trend appears to be bringing semi-bleached sulphate into competition with unbleached sulphite."

At present the industry has no generally accepted process for bleaching. Each mill has its own preferred practice and with a few exceptions the processes are based upon the use of chlorine water or chlorine gas in combination with lime bleach and other chemicals.

This industry was not a particularly important market for chlorine ten years ago when only 32,500 tons were consumed, but the situation has changed. Today, the pulp and paper industry is the most important outlet for chlorine. In 1935 it is estimated 146,000 tons of chlorine were consumed in bleaching pulp. It is interesting to note that if and when all the kraft capacity in the South is bleached, some 300,000 tons will be required for that section alone.

Trends with respect to the mineral ingredients of the sheet of paper are interesting. The urge for independently controlling the color and the opacity of paper has led to the wide acceptance of the more expensive pigments such as titanium dioxide, zinc sulphide, lithopone and titanated pigments on various base materials. A range of these products is available from the technically pure product to the less expensive extended pigments. These highly opaque materials afford a convenient way of obtaining striking results with a minimum of loading. For example, waxing

an unpigmented bread wrapper makes it quite transparent; but if this paper is pigmented with zinc sulphide or titanium dioxide a relatively high degree of opacity is maintained. The high index of refraction of these pigments contributes especially to this result. The use of these pigments in a very wide variety of grades indicates that they are now firmly established in the trade and papers are produced which have entirely new property value combinations.

The same circumstances which brought these pigments into use have also increased the use of calcium carbonate as a mineral ingredient. It is obtainable of excellent purity and color, in a wide range of particle size distributions. Calcium sulphate and sulphite are also to be mentioned in this connection.

These trends have of course long since been recognized by the producers of paper making clays, with the result that these interests have studied their problems with great diligence, particularly with respect to contributing property combinations which are unique. The encouraging phase of the matter to the paper maker is the recognition by the clay producer of such paper making requirements as smoothness, opacity, ability to take or resist polishing, and ink receptivity.

The use of a wider variety of mineral ingredients and the incorporation of larger proportions of filler together with independently controlling sheet properties have led to an increasing use of various forms of starch. It fills in the surface, serves as a mild adhesive. Since starch is not an inexpensive ingredient developments are tending toward more economical application as for example the "precipitation" of the starch in the beater or between the beater and the paper machine to improve its retention, and the withholding of the starch from the body of the sheet to concentrate it upon the surface by special means. Progress has been made in the modification of the lower priced starches directly in the mill by means of enzymes.

To render the finished sheet less receptive to water, a wide variety of sizing ingredients have been available to the paper maker for some time based on both straight rosin and rosin wax; and varying with respect to the degree of saponification, the kind and amount of free and combined alkali, the degree of dispersion and the stability of the product with respect to precipitants such as alum. The trend in sizing ingredients is toward a wider variety of water repellents and stabilizers and dispersing agents. Proteins are coming into use for the latter purpose. They appear to be particularly advantageous when used in combination with certain mineral ingredients. Ordinarily the various sizing materials are marketed as a heavy solution or emulsion but more recently there has been a trend toward handling these materials in dry form.

The consumption of plasticizers by paper mills during 1936 increased substantially over the previous year, according to N. R. Pike (1937 Report of Non-Fibrous Raw Materials Committee of TAPPI). Actual figures are not available but there can be no doubt that the use of such agents has become more widely spread. This is largely due to the increased production of standard plasticized items such as glassine, waxing stock and coated paper. Another factor is the increased demand by the trade for unique, specialty items, which usually require special properties only to be obtained by using a softening agent. This demand has been accelerated by the paper manufacturers themselves, who have become thoroughly alive to the possibilities of producing papers which are unusual, both in appearance, strength and feel, through plasticizing.

In addition to the softening agents which have become recognized as standard raw materials, i.e., glycerine, invert sugar, corn sugar and sulphonated oils, a number of materials have been introduced to the mills under various trade names. The majority of these are solutions of various sugars plus deliquescent salts. This type of plasticizer has not attained as yet, a definite standing in the industry. The results obtained by various investigators are inconclusive and any attempt to rate these agents according to relative efficiency would be premature.

Another material about which there has been considerable discussion is Sorbitol, a hexahydric alcohol. A glycerol amine has recently been introduced which seems to present attractive possibilities. It has achieved some success in textiles but little is known of its value in paper.

CHEMICALS CONSUMED IN PULP AND PAPER INDUSTRY

(In Tons)

	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936
Alum	100,000 [8]	....	115,000 [9]	....	103,000 [9]	....	107,000 [9]	107,500 [9]	117,500 [9]	....
Caustic Soda	33,000 [8]	33,000 [8]	45,000 [8]	42,000 [8]	36,500 [8]	34,000 [8]	40,000 [8]	33,000 [8]	40,000 [8]	46,000 [8]
Casein Size	20,000 [9]	23,000 [9]	18,451 [5]	16,000 [9]	15,000 [9]	15,000 [9]	17,000 [9]	17,000 [9]	18,000	20,000 [9]
China Clay	....	237,395 [6]	268,519 [6]	279,132 [6]	275,469 [6]	230,445 [6]	255,989 [6]	249,852 [6]	320,000 [9]	360,000 [9]
Chlorine	32,500 [8]	....	70,000 [5]	....	....	....	....	....	146,000 [8]	163,000 [8]
Lime	429,606 [6]	429,334 [4]	411,017 [6]	378,721 [4]	286,745 [6]	260,000 [4]	305,000 [4]	293,798 [4]	344,531 [6]	....
Lime Stone	289,000 [6]	155,050 [4]	273,880 [6]	248,790 [6]	194,310 [6]	152,710 [4]	196,440 [6]	262,160 [6]	194,000 [6]	....
Rosin	74,000 [2]	....	38,390 [5]	....	....	65,000 [1]	82,000 [1]	85,000 [1]	88,000 [1]	90,000 [9]
Rosin Size	....	....	99,443 [5]	....	71,962 [5]	....	....	....	....	....
Sulphur	260,000 [8]	250,000 [8]	265,000 [8]	235,000 [8]	178,000 [8]	153,000 [8]	197,000 [8]	176,000 [8]	204,000 [8]	....
Soda Ash	85,000 [8]	....	110,000 [8]	100,000 [8]	....	66,000 [8]	63,000 [9]	70,000 [8]	80,000 [8]	90,000 [8]
Silicate of Soda, 40 deg	201,807 [9]	....	236,538 [9]	....	265,781 [9]	....	252,156 [9]	....	283,675 [9]	....
Salt Cake	90,000 [9]	116,000 [9]	138,000 [9]	143,000 [9]	137,000 [9]	154,000 [9]	189,000 [9]	187,000 [9]	225,000 [9]	....

[1] Rosin used in paper and paper size — Bureau of Chem. & Soils, Apr. 1–Apr. 1. [2] Dept. of Agriculture. [4] Nat. Lime Assoc. [5] Census of Mfg. [6] Bureau of Mines. [8] Estimate of Chem. & Met. [9] An estimate. Tabulation prepared with cooperation of TAPPI Non-Fibrous Raw Materials Committee

TOTAL UNITED STATES PRODUCTION OF WOODPULP

By Grades — 1925–1935, Tons

Year	Total	Unbleached Sulphite	Bleached Sulphite	Bleached Sulphate	Total Sulphate	Groundwood	Soda	All Others
1925	3,962,217	790,510	612,576	31,797	409,768	1,612,019	472,647	64,697
1926	4,394,766	911,729	646,466	24,755	519,960	1,764,248	496,920	55,463
1927	4,313,403	872,411	680,288	36,195	603,253	1,610,409	487,478	59,564
1928	4,510,800	836,751	722,107	40,551	774,225	1,610,988	488,641	78,088
1929	4,862,885	848,754	839,953	......	910,888	1,637,653	520,729	104,908
1930	4,630,308	815,897	751,166	66,719	949,513	1,560,221	474,230	79,281
1931	4,409,344	675,859	740,812	53,939	1,034,291	1,449,240	374,054	135,088
1932	3,760,267	548,702	596,937	62,251	1,028,846	1,203,044	290,703	92,035
1933	4,329,248	543,957	742,662	63,413	1,263,222	1,197,553	581,854**	......
1934	4,281,428	599,905	806,612	95,477	1,240,967	1,253,398	294,089	86,457
1935	4,894,824	608,442	919,961	168,708	1,415,096	1,140,313	473,068	82,912

Source: 1925–1933 U. S. Bureau of the Census
Notes: 1934 and 1935 data and all bleached sulphate data from United States Pulp Producers Association. **Includes all others.

PETROLEUM REFINING INDUSTRY

USED

966,240,000 Bbl.	Crude Oil
38,964,000 Bbl.	Natural Gasoline
1,000,000 Tons	Sulphuric Acid (50 deg.)
90,000 Tons	Caustic Soda
8,000 Tons	Soda Ash
206 000 Tons	Fullers' Earth
100,000 Tons	Lime
7,000 Tons	Sulphur
6,000 Tons	Litharge
10,000 Tons	Calcium Chloride
4,800,000 Gal.	Organic Solvents
$10,000,000	Gum Inhibitors, Dyes, Organic Stabilizers, etc.
$100,000,000	Estimated Total Chemicals

Chem. & Met. estimates

TO MAKE

Gasoline	457,692,000 Bbl.
Kerosene	55,812,000 Bbl.
Lubricants	27,768,000 Bbl.
Residual Fuel Oil	254,748,000 Bbl.
Gas Oil and Distillate Fuels	100,380,000 Bbl.
Asphalt	3,252,000 Tons
Wax	225,000 Tons
Petroleum Coke	1,464,000 Tons

Refinery Operations in 1935 Were at 75% of Capacity

U. S. Bureau of Mines from "Survey of Current Business"

PETROLEUM REFINING continues to represent an ever-widening market for an increasing number and variety of chemicals. Viewed in the aggregate it has been estimated that this industry spends as much as $100,000,000 a year for chemical products. Most important of these is tetraethyl lead, for which unfortunately no figures are available. Other products of organic synthesis have increased in importance to such an extent, however, that sulphuric acid, caustic soda and litharge, once the mainstays of the refining industry, now represent less than a fifth of the total expenditures for chemicals. The accompanying charts based on those of Keith and Forrest (see *Chem. & Met.* June, 1934, pp. 292 ff.) show some of the more significant trends.

Sulphuric-acid requirements of the petroleum refiners have been gradually decreasing during recent years. The demand for 1935, for example, was estimated at 1,000,000 tons of 50 deg. as compared with 1,100,000 tons in 1934 and the 1929 peak of 1,480,000 tons. With increasing business in 1936, it is believed that the decline has been arrested and the demand for sulphuric acid has leveled off at least temporarily. Caustic soda demand has likewise decreased from its 135,000 ton peak to an estimated 90,000 tons in 1935. The 1936 estimate is 98,000 tons emphasizing the fact that the alkali requirement is not definitely fixed to the acid consumption.

Technical advances within the industry have been largely responsible for the changes in chemical consumption. The growing practice of treating gasoline in the vapor phase with clay, of treating with zinc chloride, of improved technique in acid treatment and the widespread utilization of solvent extraction methods in lubricating oil manufacture, have all tended to decrease the use of sulphuric acid.

Likewise the recovery of spent acid from sludge and the most recent practice of manufacturing acid from hydrogen sulphide available in refinery gases (see *Chem. & Met.*, Jan. 1937, p. 33), threaten to make still further inroads on the total purchased requirements. Gas-purification installations now under construction yield hydrogen sulphide which is oxidized to sulphuric acid at very low cost. One such plant using the phenolate process produces 85 tons of sulphuric acid daily from H_2S recovered from 13,000,000 cu.ft. of cracked gases. It is estimated that sufficient hydrogen sulphide is available from refinery cracked gases to supply the industry with more than its entire acid needs. However, this potential will in all likelihood never be recovered. Another factor influencing sulphuric acid and caustic soda demands alike is that of entirely eliminating treating through the use of improved operations, better fractionation and the addition of gum and color inhibitors. It is estimated that such purchases of organic chemicals including the gum inhibitors, the color stabilizing chemicals and dyes, now provide the chemical industries with the business of more than $10,000,000 per year.

The long familiar "doctor" treating system using sodium plumbite has been affected by competitive treating processes which use zinc chloride, copper chloride, lead sulphide or calcium hypochlorite instead of the caustic-soda-litharge combination. At one time it was estimated that petroleum refining consumed about 15 per cent of all litharge produced but in recent years that consumption has dropped from around 13,000 tons annually to about 6,000 tons.

In addition to the 8,000 tons of soda ash used by the petroleum industry to produce its own caustic soda, as much as 40,000 tons of soda ash are annually used for water softening. Sodium aluminate costs for the same purpose have been estimated at $223,000 per year. The industry normally requires from 6,000 to 8,000 tons of sulphur. Caustic potash demand has been reported at around $50,000 annually. Fire extinguisher chemicals are said to range

in annual cost from $75,000 to $100,000.

In addition to caustic soda for corrosion prevention in vapor lines and the like, the industry used about $500,000 worth of ammonia last year. This is purchased in both the anhydrous and aqua form for in addition to its use in combating corrosion, large quantities are employed in the refrigeration systems necessary for operation of dewaxing processes. Both direct expansion of ammonia and indirect chilling through the use of calcium chloride brine, are used. Although the greater portion of the market demand for calcium chloride, which is believed to be a total over 10,000 tons annually, is used in refrigeration work, the new application of this chemical in processes for dehydration of natural gas may tend to bring about some increase. Another calcium compound widely used in the industry is lime. A recent estimate of the consumption of chemical lime in petroleum refineries placed the annual demand at around 100,000 tons.

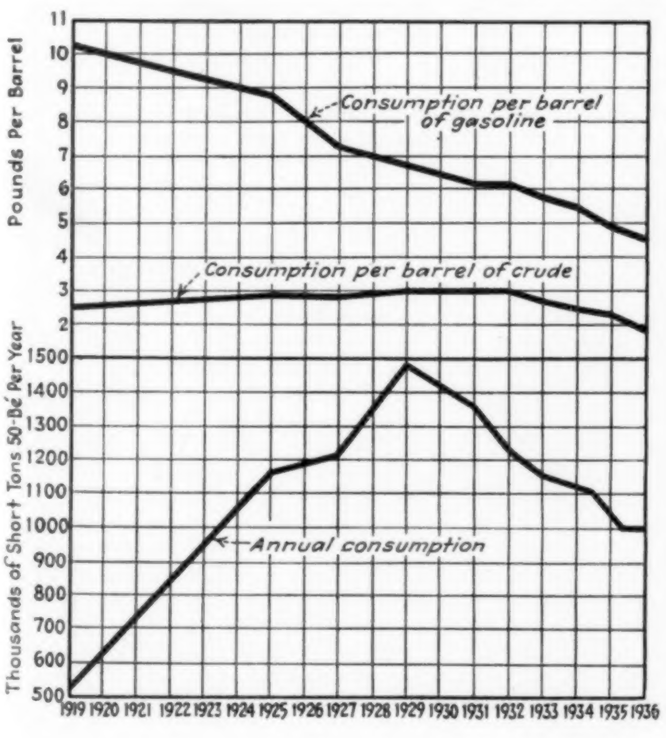
Purification of refinery gases, which must be cleaned of hydrogen sulphide before they are charged to polymerization units and other processes, requires the use of different chemicals. The phenolate process, previously referred to, employs caustic soda and crude phenol. The Girbitol process uses organic amines such as triethanolamine and monoethanolamine.

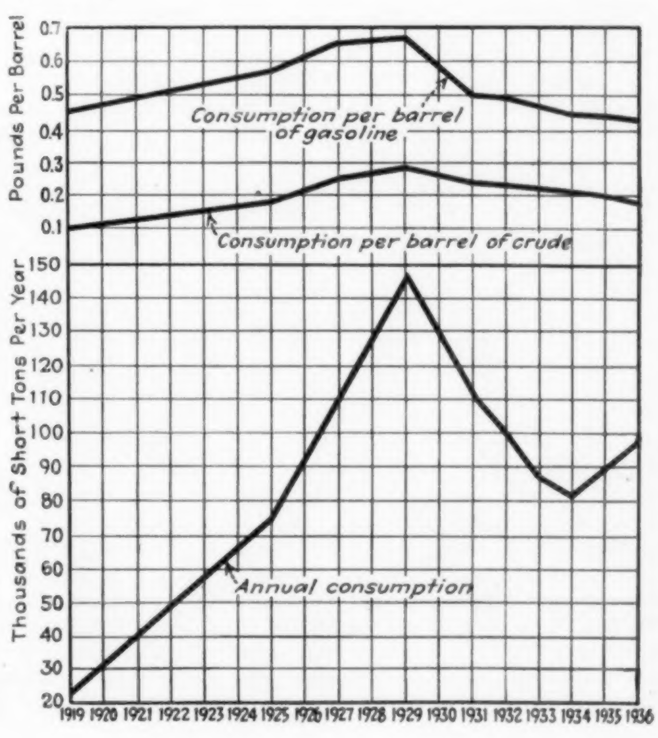
Consumption of fullers earth for filtration work has shown little fluctuation during recent years. The earth is used both for filtering lubricating oils and in the vapor-phase clay treating systems for motor fuel. While the demand for fullers earth in percolation filters has decreased slightly, there has been an increasing use in vapor-phase clay-treating systems. During the past four years the consumption of fullers earth has averaged from 202,000 to 206,000 short tons. There are no figures available covering the demand for the acid-treated and the raw finely ground contact clays but some commentators have estimated this consumption at approximately 50 per cent of the demand for fullers earth.

The most important increase in demand for chemicals during recent years in petroleum refining has been that brought about by the widespread adoption of solvent dewaxing and solvent extraction processes employed in the manufacture of lubricating oils. In the solvent extraction field there has been an increased demand for such solvents as furfural, phenol, cresol, nitrobenzol, sulphur dioxide, benzol, dichlorethyl ether, crotonaldehyde and other organic chemicals. In the dewaxing field the solvents required have been ethylene dichloride, trichlorethylene, carbon tetrachloride, acetone, certain higher ketones, benzol and propane,—this last mentioned being the only one of the group manufactured by the refiners themselves. In 1936 it is estimated that over 10,000,000 lb. of these solvents were purchased. Further, the demand will no doubt be sustained because of inevitable plant losses in operation and because of continued expansion in the use of solvent refining processes. It is estimated that the work of installation of such processes in the industry is only about one-half completed.

Reference has already been made to the widespread use of tetraethyl lead which is believed to represent the major chemical outlay of the petroleum refiners. The ethylene dibromide used with the lead compound to enhance the anti-knock properties of motor fuel also runs into substantial amounts. Lately phosphoric acid compounds have been used as catalysts in one of the polymerization processes. Aluminum chloride continues to be used in one process of refining lubricating oils. Gum inhibitors, previously mentioned, are the products of wood distillation, amines and other nitrogen-containing compounds. Oil-soluble dyes of coal tar origin have been widely used in recent years and some of the newer products have the double function of stabilizing color and inhibiting gum formation. Addition compounds for lubricating oil to improve film strength and oiliness, to depress the pour-point, etc., are becoming more widely used. These may be halogenated fatty acids, organic phosphates such as tricresyl phosphate, halogenated aromatics such as chlorinated diphenyl and diphenyl oxide, or oxidized hydrocarbon derivatives of complex composition. Then there is a widening application of materials for extreme pressure lubricants which include lead soaps, sulphur, in free and combined forms, chlorinated substances and other synthetic organic chemicals.

Long-time trends in the consumption of sulphuric acid (shown at left) and caustic soda (shown at right) in the petroleum refining industry





PAINT AND VARNISH INDUSTRY

USED

230,146,000 Lb.	Linseed Oil
98,435,000 Lb.	China-Wood Oil
27,164,000 Lb.	Perilla Oil
3,480,000 Lb.	Castor Oil
3,151,000 Lb.	Other Vegetable Oils
28,951,000 Lb.	Fish Oils
4,000 Long Tons	Sulphur
6,550,000 Lb.	Carbon Black
124,615 Tons	Lithopone
29,632 Tons	Leaded Zinc Oxide
25,289 Tons	Zinc Oxide
91,297 Tons	White Lead
7,770 Tons	Basic Lead Sulphate
8,721 Tons	Red Lead

Sources: U. S. Census of Manufactures 1935 and U. S. Bureau of Mines

TO MAKE

Plastic Paints	4,982,156 lb.
Cold Water Paints	17,868,777 lb.
Calcimines	76,550,322 lb.
Clear Lacquers	7,960,353 gal.
Pigmented Lacquers	9,814,574 gal.
Lacquer Bases and Dopes	1,793,237 gal.
Thinners	16,929,247 gal.
Total Paint and Varnish Sales to Industry	$70,099,360
To Trade	$130,355,319

Source: U. S. Bureau of Census

WITH THE RETURN of prosperity has come a large home and business building program which naturally means increased demand for products of the paint and varnish industry. These buildings must be painted on the exterior and interior. Likewise the furnishings for these structures must be given a surface finish. Increased incomes also have vastly enlarged the output of automobiles, electric refrigerators and other goods that require enamels, varnishes and paints.

Many authorities predict even better business for these materials in the current year, with volume and prices above those of 1936 and probably exceeding the record year of 1929. An increased output of paints, varnishes and lacquers means that there will be an increased consumption of oils, pigments and other raw materials that are used in the production of these finishes. Present trends point to a continued increase in the consumption of white pigments, particularly of titanium oxide and zinc sulphide pigments. High covering pigments are the basis of most modern formulas. Titanium and zinc sulphide pigment plants, though operated during 1936 below the rated capacity, produced close to their actual capacity. However, the plant of the Southern Mineral Products in Virginia produced comparatively little titanium pigments and near the close of the year became the property of the Virginia Chemical Corp. In case the demand for these materials continues to increase there will probably be a tendency toward rising prices. There is no particular advantage to the pigment manufacturer in mixing bulking pigments with titanium dioxide and the result is that during 1936 about two-thirds of the titanium dioxide sold was undiluted.

The chief threat to conventional lithopone is pure zinc sulphide. As a result of improvements, together with its present lower price, it is in line to be used, mixed with the proper extending pigments, in competition with normal lithopone. These mixtures, however, cannot be used pound for pound for lithopone with the expectation of producing identical products. Several new methods of making zinc sulphide have been developed in the last two or three years. These not only make products equal in quality to the zinc sulphide contained in lithopone but they make it just as cheaply as it can be produced in lithopone. This has thrown the spotlight on the barium sulphate component of lithopone.

Until recently there has been only one producer of zinc sulphide and at the present time that manufacturer retains three-quarters of the business. However, three or four other companies are said to be planning to go into the production of this pigment. It is not likely that these plants will have matured to the point where the actual production of zinc sulphide will materially affect the white pigment situation during 1937. They will, however, affect the question of what kind of new plants are installed to take care of the increasing demand for high whitening power pigments which the future is bound to develop.

Official information is not available as to the quantities of the several white pigments produced during the last year, but it is estimated that 60,000 tons (TiO_2) of titanium dioxide were produced, of which slightly under 40,000 tons were sold as undiluted pigment and the balance in the form of calcium or barium base pigment. On the basis of 30 per cent titanium dioxide in these pigments, the total tonnage of all titanium pigments would probably be in the neighborhood of 110,000 tons.

The lithopone production in 1936 probably was about 15 per cent ahead of 1935, which would bring the amount produced to between 180,000 and 185,000 tons. There has probably been a further increase in the use of leaded zinc oxide to 35,000—38,000 tons, and in lead free zinc oxide to 115,000—120,000 tons. White lead in 1936 amounted to about 110,000 tons for the basic carbonate and to perhaps 9,000—10,000 tons for the sulphate.

The paint and varnish industry has

been using the same oils for the past decade, although economic factors and technical trends have brought about a change in the relative importance of the various oils.

Linseed oil is still the most important of the drying oils. Tung oil, second in volume by a wide margin, is employed principally in the formulation of varnishes and enamels. While almost our entire requirements of tung oil are imported the amount of domestic oil is slowly increasing. The 1936 crop of nuts produced 2,000,000 lb. of oil and planters expect 13,000,000 lb. from the next crop.

The volume of soybean oil consumed by the industry has been on the increase. The Glidden Co's. new plant commenced operations during the year 1936, and a plant with a capacity of 28,000 bushels of beans per day will start operations in a few months. The use of this oil is being advocated by governmental bodies and agricultural groups. Manchurian perilla oil has come in for more attention in recent years and attempts have been made to develop an American supply but the experiment has not met with any real success. The consumption has been limited by the availability of oil.

Fish oil has been developed in improved forms. While the price factor has had much to do with the popularity of the oil, it has been reinforced by improved quality of fish oils and a greater variety of refined, bleached and processed oils. While fish oil is probably used to some extent in the thin state, especially in metal and heat resisting paints, it has better paint characteristics in the heat bodied and blown forms. It dries at about the same rate as linseed oil but the surface is slightly more tacky, the film softer and more distensible.

Perhaps the most important trend in the paint and varnish industry is the use of synthetic resins in formulas. Not only are synthetic resins replacing fossil and natural resins, but they are replacing drying oils to a considerable extent and very notably are being substituted for nitrocellulose lacquers in many types of coatings.

The demand for increased speed of drying and better resistance properties has been steadily increasing over the past 10 years. Today in spar varnishes, floor varnishes and enamels, furniture varnishes and industrial finishes the consumer demands a speed in application and quality of finish not obtainable in other than synthetic resins.

While greater quantities of the drying oils are being used due to the total volume of paint products produced, nevertheless there is a growing tendency to use a greater percentage of resin in varnishes and enamels than previously. The reasons for this are outlined below under modern synthetic resins.

Formerly nitrocellulose lacquers were supreme in automotive finishing and were growing fast in furniture and other industrial finishing. Today the baking type synthetic resin enamel is making serious inroads in automobile and industrial finishing, while quick-drying synthetic resin varnishes are mounting in the furniture finishing field.

The synthetic resins used by the paint and varnish industry today are substantially of two classes: 1. The phenol-formaldehyde type; 2. The glycerol-phthalate-fatty acid type.

1. Phenol-formaldehyde resins are divided into two main classes: (a) Straight phenolic or 100 per cent phenolic. These may be either heat-reactive or permanently fusible. (b) Reduced phenolic resins dispersed in rosin or ester gum and known under the general classification of Albertols.

2. The glycerol-phthalate type known as alkyds cover many variations, particularly as to the type and percentage of fatty acids used with the glycerol-phthalate base. They may be used with high fatty acid content as air-drying coatings or with higher glycerol-phthalate content as baking coatings.

The straight phenolic resins and the lower fatty acid content alkyds are more durable than the ordinary drying oils and are faster drying. In addition they offer much greater protection against corrosive conditions. The straight phenolic resins particularly impart to protective coatings high moisture-proofness and resistance to alkalis and acids. In many of the modern finishes the paint and varnish manufacturer combines both to take advantage of the specific properties of each. This "fortifying" effect of the straight phenolic is not only being used with alkyds but is being used in increasing rates to modify many of the older type finishes containing rosin, ester gum or fossil resins.

In addition to the two main classes of synthetic resins there has been gain in several other types, notably in Vinylite base coatings as beer can linings and in cumarone resins in printing inks and some types of baking coatings.

Domestic Sales of Pigments

Short tons

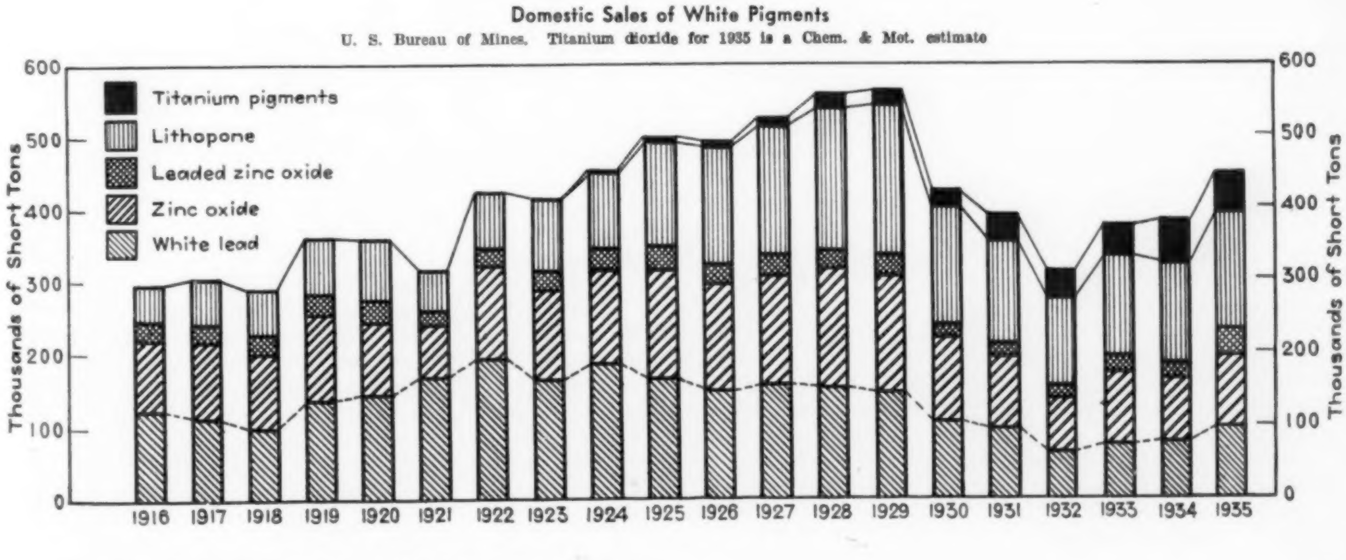
U. S. Bureau of Mines

	1935	1936
Basic lead sulphate or sublimed lead:		
White	7,572	7,500
Blue	727	900
Red lead	28,776	33,700
Orange mineral	252	250
Litharge	79,930	96,000
White lead:		
Dry	27,972	31,700
In oil [1]	68,859	84,200
Zinc oxide	99,697	129,400
Leaded zinc oxide	29,976	39,500
Lithopone	159,486	[2]
Zinc sulphate	7,108	8,300

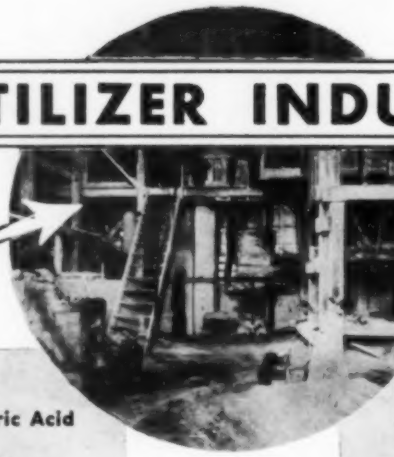
[1] Weight of white lead only.
[2] Figures not yet available.

Domestic Sales of White Pigments

U. S. Bureau of Mines. Titanium dioxide for 1935 is a Chem. & Met. estimate



FERTILIZER INDUSTRY



USED

1,910,000 Tons	Phosphate Rock
1,825,000 Tons	Acidulated Sulphuric Acid (50 deg.)
70,000 Tons	Other Phosphate Rock
40,000 Tons	Bone Meal and Other Phosphate Carriers
436,000 Tons	Muriate of Potash
55,000 Tons	Sulphate of Potash
55,000 Tons	Kainit
54,000 Tons	Manure Salts
20,000 Tons	Other Potash Salts
55,000 Tons	Liming Materials
580,000 Tons	Sodium Nitrate
570,000 Tons	Ammonium Sulphate
70,000 Tons	Anhydrous Ammonia and Mixtures
240,000 Tons	Other Inorganic N Carriers
340,000 Tons	Organic N Carriers
350,000 Tons	Fillers

TO MAKE

Superphosphate	3,300,000 Tons
Into mixed fert.	2,720,000 Tons
Used as such	580,000 Tons
Mixed Fertilizers (Average analysis: $9\frac{1}{2}$% P_2O_5 6% K_2O 4% N)	4,600,000 Tons
Materials used as such or for home mixing:	
Superphosphate	580,000 Tons
Phosphatic materials	80,000 Tons
Potash Chemicals	75,000 Tons
Liming Materials	55,000 Tons
Sodium Nitrate	480,000 Tons
Ammonium Sulphate	160,000 Tons
Other N Inorganics	85,000 Tons
Organic N Materials	85,000 Tons
Total Sold	6,200,000 Tons

Source: Chem. & Met. estimates

FERTILIZER mixing and marketing constitute more and more of this industry's activity. Chemicals makers continue to take over in larger measure year by year the problem of chemical processing of natural materials into those constituents which the fertilizer man mixes. This is not a new trend, but it is one that continued conspicuously in 1936.

Last year (1936) nearly 7,000,000 tons of fertilizer were used in the United States. This total tonnage was made up of complete and other mixed fertilizers and that group of chemicals used separately, like sodium nitrate, ammonium sulphate, super-phosphate, and potash chemicals. Apparently the trend toward slightly higher concentration of plant food in mixed goods was interrupted. Certainly in some important fertilizer-using states there were larger than normal percentages of total sales in lower-concentration goods. This backward movement undoubtedly resulted primarily from the increased intensity of competition, which is discussed below.

Despite the slight back trend in concentration of some materials there was an up trend in total use of plant food. It appears that the tonnage of contained potash, nitrogen, and P_2O_5 was nearly equal to the peak tonnage of the years 1928-30, when substantially higher gross tonnages were sold. Thus agronomic practice broadly did not slip back.

The uncertainty which surrounded final action at the Federal Trade Commission on the proposed code of fair practice gave substantial encouragement to the old-school members of the industry. It was inevitable, therefore, that 1936 should see a renewal of many of the bad merchandising practices which had been definitely restrained during the reign of the Blue Eagle code, and even during 1935 when the industry was making a sincere effort to continue the merchandising benefits.

The F.T.C. Code which was announced in tentative form in November can be expected to be only a palliative for these merchandising headaches. National Fertilizer Association is continuing to press urgently its request for open-price filing as an added feature of the code. Many in the industry feel that unless the permission is granted to maintain such practice there is little hope for return to the more conservative and constructive sales programs of 1935.

No one can convincingly prove the full economic effect of these merchandising controversies. Some of the consequences are all too obvious. It is clear that the fertilizer industry made much smaller profits on larger tonnages in 1936 than in the preceding year. But apparently this did the farmer no good, for the delivered price of fertilizers appears to have been very nearly the same and the average plant food delivered per dollar appears to have been slightly smaller. Advocates of more rigorous code regulation rather convincingly argue that the farmer currently suffers more than the industry from these bad merchandising practices. In the long run it is sure that agriculture would so suffer, since aggressive development and low delivered costs are incompatible with recent cut-throat price "adjustments." Even the Robinson-Patman Law, if rigorously enforced, would hardly suffice to do away with all the secondary evils involved.

What was probably the outstanding technical development of the year affecting fertilizer occurred outside the

industry, as a part of the research and development work of the Tennessee Valley Authority. That agency made an elaborate series of commercial-scale trials of new methods for manufacture of high-concentration phosphates. The results, many of which have already been published in *Chem. and Met.*, give a clear indication of the relative costs per unit of plant food of the newer furnace methods and for some new high-concentration materials.

T.V.A. does not intend to commercialize these developments itself to the extent of manufacturing for sale. But some farm organizations are urging the Authority to change its policy. Such change would, however, involve the great risk of break-down of the defense in the federal courts which T.V.A. has offered to the charge that it exceeds federal authority on waterway and power matters. Some of those who most carefully studied the situation express the hope that commercial development of these new processes, so far as they give promise of early commercial success, will take place under industrial sponsorship, thus making the action unnecessary which has been urged on T.V.A.

Nitrogen Trends

No novel trends in nitrogen manufacture or use in fertilizers developed during 1936. That period was essentially a time of recovery. The use of nitrogen on the farm was substantially greater than in the preceding year, probably nearly equal to the peak years of 1928-30, but this improvement was merely in association with greater total tonnages of fertilizer sold.

The production of ammonia at coke and gas works increased about 30 per cent, just in proportion to byproduct coke output. Imports of nitrogen chemicals increased by a slightly larger percentage (nearly 35 per cent). Exports of nitrogenous materials were slightly greater in total tonnage and still higher relatively in contained nitrogen because of the shift from nitrate to ammonium sulphate as the major nitrogen carrier exported. Sales of synthetic nitrogen products continued to grow in conservative but encouraging fashion. The ammoniation of superphosphate remains as the principal method for applying these synthetics, both anhydrous ammonia and the special mixtures such as ammonia-urea and ammonia-ammonium nitrate.

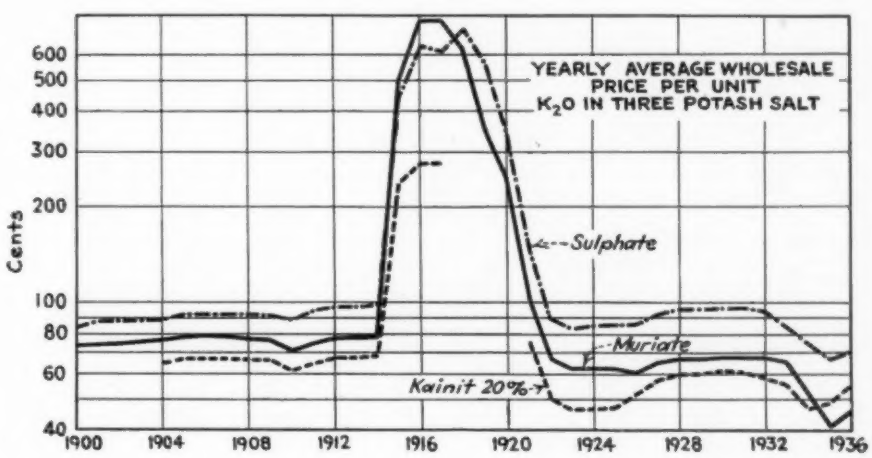
No better picture of the world situa-

Where U. S. Got Its 1935 Nitrogen

	Tons of N contained
Domestic production	
By product	115,000
Synthetic	175,000
Imports	140,000
Exports	45,000
Apparent consumption	385,000
Actual consumption in fertilizer	320,000
In other industry	90,000
Apparent decline in visible stocks	25,000
Organic nitrogen carriers for fertilizer and used as such	20,000

Industrial Use of Non-Fertilizer Nitrogen in 1935

	Tons of N contained
For explosives	25,000
Nitric acid not for explosives	24,000
Soda ash manufacture	7,000
Refrigeration	8,000
Ammonium salts	4,500
Cyanides	3,500
Nitrates (other than above)	3,000
Water treatment, etc	15,000
Total	90,000 Tons



World Production and Consumption of Nitrogen

British Sulphate of Ammonia Federation estimates for the indicated fertilizer years, all expressed in thousands of metric tons of contained nitrogen.

PRODUCTION:—	1926/27	1927/28	1928/29	1929/30	1930/31	1931/32	1932/33	1933/34	1934/35	1935/36
Sulphate of Ammonia:										
Byproduct	328	368	376	425*	360	302	258	307	321	365
Synthetic	300	367	485	442	349	522	560	535	533	630*
	628	735	861	867	709	824	818	842	854	995*
Cyanamide	180	198	192	264	201	134	168	195	232	270*
Nitrate of lime	81	105	136	131	110	79	118	107	153	156*
Other forms of Nitrogen**:										
Synthetic	183	242	383	427	393	348	462	516	607	720*
Byproduct	50	54*	51	51	31	30	40	48	45	45
Chile nitrate	200	390	490*	464	250	170	71	84	179	192
Total production	1,322	1,724	2,113	2,204	1,694	1,585	1,677	1,792	2,070	2,378*
Percentage increase or decrease	−0.8%	+30.4%	+22.6%	+4.3%	−23.1%	−6.4%	+5.8%	+6.9%	+15.5%	+14.9%
CONSUMPTION:—										
Manufactured Nitrogen	1,091	1,249	1,453	1,587	1,377	1,417	1,620	1,714	1,876	2,182*
Chile nitrate	275	393	419*	364	244	138	127	164	195	218
Total consumption	1,366	1,642	1,872	1,951	1,621	1,555	1,747	1,878	2,071	2,400*
Percentage increase or decrease	+8.6%	+20.2%	+14.0%	+4.2%	−16.9%	−4.1%	+12.3%	+7.5%	+10.3%	+15.9%
Agricultural consumption about	1,190	1,460	1,670	1,750	1,455	1,412	1,586	1,673	1,812	2,068*
Percentage increase or decrease	+6.5%	+22.7%	+14.4%	+4.8%	−16.9%	−3.0%	+12.3%	+5.5%	+8.3%	+14.1%

* Record.

** Including nitrogen products used for industrial purposes (except Chile nitrate) and ammonia in mixed fertilizers.

NOTE.— Fertilizers are included in these tables under the final form as sold, so that, for example, cyanamide if converted into sulphate of ammonia is included under synthetic sulphate of ammonia, or, if into ammophos, is included under other synthetic nitrogen.

Nitrogen Materials Used in Mixed Fertilizers

	Total tons	Tons of N contained
Anhydrous ammonia	70,000	42,000
Ammonium sulphate	410,000	85,000
Sodium nitrate	100,000	16,000
Other inorganics	155,000	28,000
Organics	255,000	14,000
Total	990,000	185,000

(Total equivalent to 4% N in mixed goods.)

U. S. Foreign Trade in Nitrogen in 1935

	Tons of N contained
Imports:	
Sodium nitrate	70,000
Ammonium sulphate	18,000
Cyanamide	25,000
Cal-Nitro	9,000
Crude KNO_3	6,000
Calcium nitrate	4,000
Other fertilizer	4,500
Industrial chemicals	5,500
Total	142,000
Exports:	
Sodium nitrate	21,000
Ammonium sulphate	18,000
Ammonium phosphate	3,500
Others for fertilizers	3,000
Industrial chemicals	1,500
Total	47,000

(Net balance of trade: Imports less exports = 95,000 tons of N contained.)

tion can be had than the splendid table issued annually by British Sulphate of Ammonia Federation, which is reproduced in these pages. From those data it is evident that Chile nitrate has had some encouragement as compared with the more depressing period of 1931-34; but even with renewed consumption, this source of natural nitrates supplies barely 9 per cent of the world's demand. It is notable also that the fertilizer year 1935-36 represented a year of record consumption of nitrogen, including an all-time record for consumption of synthetic forms. Every division of nitrogen synthesis shared in the record.

Despite the year of record operations in the synthetic nitrogen plants of the world, these establishments operated at less than 50 per cent of rated capacity. The world productive capacity for synthetic nitrogen, including cyanamide, is estimated by British Sulphate of Ammonia Federation to be 3,700,000 metric tons of contained nitrogen per year. Actual production in 1935-36 was nearly 15 per cent above that of the preceding year. The most marked increases occurred in Germany, Japan, U.S.A., and Russia. Classified according to the products used in agriculture, consumption last year was:

Ammonium sulphate	48 per cent
Cyanamide	12–13
Chile nitrate	9
Lime ammonia nitrate (nitrate chalk)	7–8
Calcium nitrate	7–8
Other synthetic products	13–15

(Estimates by British Sulphate of Ammonia Federation.)

Cottonseed meal, less in demand for feed than in the preceding seasons, became lower in cost and hence a more attractive fertilizer constituent for the season 1935-36. Also the increased tonnage of fertilizer made stimulated a greater tonnage of meal used. It is estimated by the National Fertilizer Association that fertilizer makers' use in 1935-1936 was 42,000 tons of cottonseed meal, in contrast with 34,000 tons used in the preceding fertilizer year (ending July 31). Direct use of meal by farmers increased even more markedly, from 85,000 tons in 1934-35 to 139,000 tons in 1935-36.

Potash in 1936

Potash supply for American users during 1936 came from three major mining producers, a few small byproduct potash enterprises, and imports by N. V. Potash My. Domestic production continued during the year at near plant capacity, about the same rate that prevailed during the last few months of 1935. Consumption in 1936 was distinctly greater than during 1935, but shipments were slightly less.

Chilean Nitrate Industry

(In thousands of metric tons)

Year	Production	Exports	Consumption	Stocks
1925/26	2,620	2,250	2,130	1,710
1926/27	1,320	1,540	1,780	1,230
1927/28	2,550	2,870	2,560	1,180
1928/29	3,280	2,960	2,740	1,650
1929/30	3,000	2,200	2,330	2,650
1930/31	1,580	1,680	1,530	2,410
1931/32	1,070	920	890	2,650
1932/33	450	270	820	2,270
1933/34	540	1,160	1,020	1,360
1934/35	1,130	1,280	1,230	1,150
1935/36	1,220	1,360	1,380	1,000

Data from Department of Commerce, except final year, partly estimated by *Chem. and Met.*

The fertilizer industry continues to be the major outlet for potash. And the concentration of K_2O in mixed fertilizer is estimated to have been slightly higher in 1936 than in any previous year. This tendency, accentuating the increased tonnage of fertilizer sold, means that 1936 represented a high point in potash consumption for recent years, about equal to the average of 1928, '29, and '30, when substantially larger tonnages of fertilizer were sold.

Liming Materials in United States

Thousands of tons applied on soil in 1935 estimated by National Lime Association

Ground limestone	1,800
Limestone screenings	580
Burned lime	90
Hydrated lime	200
Marl	420
Miscellaneous materials*	200
Total liming materials	3,290

* Includes ground shell, byproduct lime, etc.

Total contained effective lime oxide is estimated as 1,570,000 tons, computed on the following basis: 35% for limestone screenings and farm-dug marl; 50% for ground limestone, miscellaneous materials and commercial marl; 70% for hydrated lime; and 85% for burned or quicklime.

The 1935 consumption is estimated to represent an increase of 35 per cent over the tonnage of liming materials used in the preceding year.

Potash Chemicals Used in Fertilizer

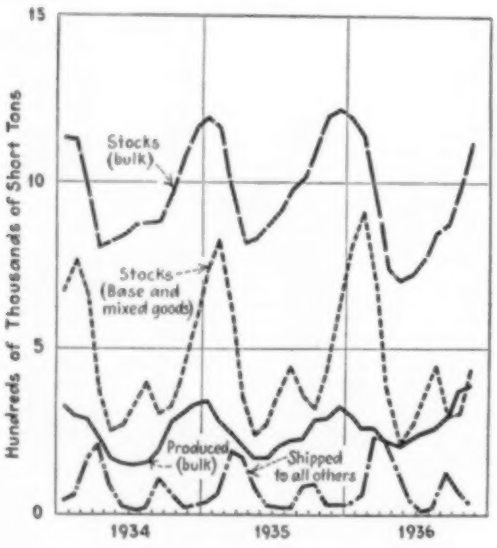
Estimates of American Potash Institute for 1935 in thousands of short tons. Percentages indicate average K_2O content of materials as delivered that year.

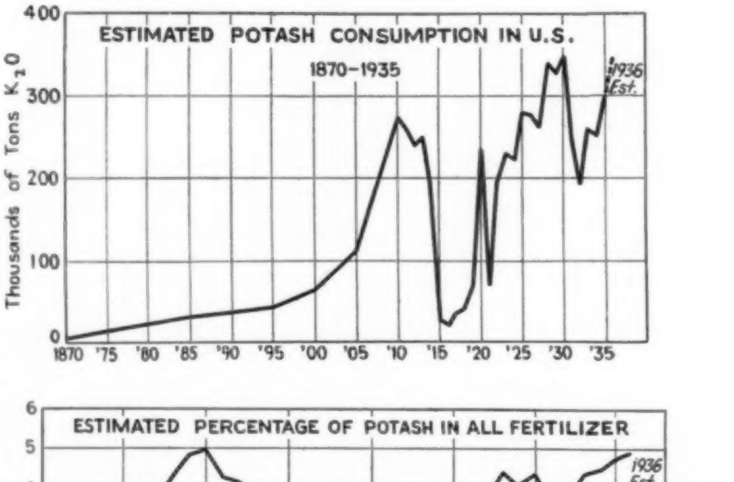
	Goods tonnage	Tonnage of K_2O contained
Muriate (55%)	436	255
Manure salts (30%)	54	18
Sulphate (48%)	55	30
Potash-magnesium sulphate (27%)	10	3
Kainit (20%)	55	12
Other materials (20%)	10	2
Totals	620	320

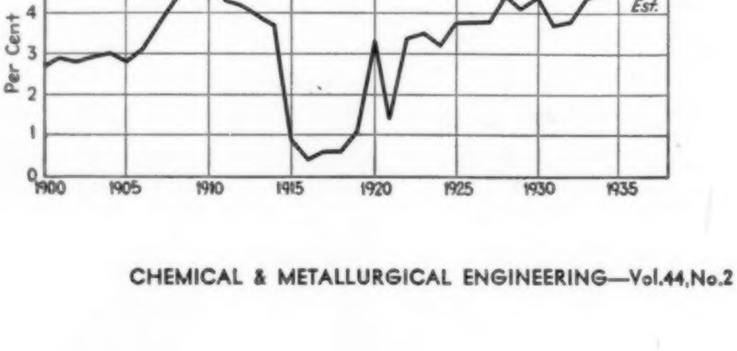
Of this material approximately 75,000 tons, containing 30,000 tons of K_2O, were used as such. The balance went into mixed fertilizer

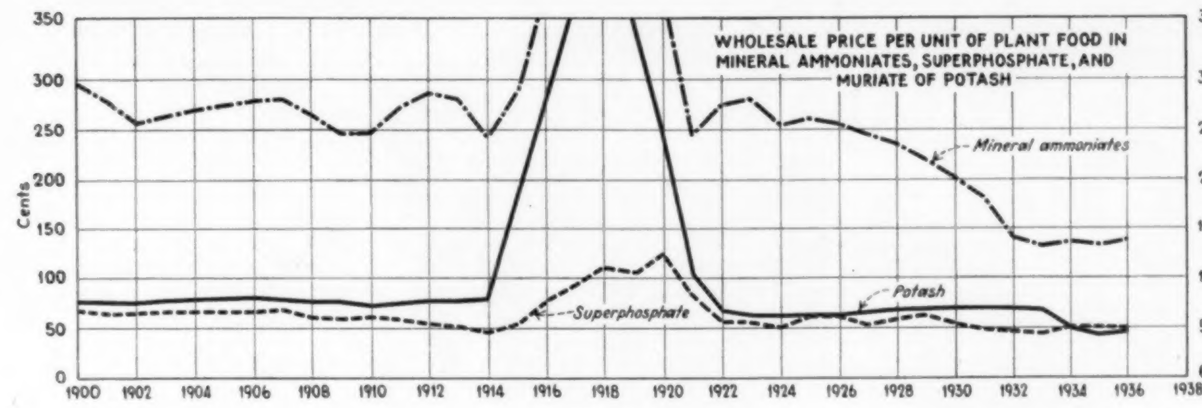
These superphosphate data (from U. S. Bureau of Census) which are significant in showing seasonal variations do not show tonnages of 16% equivalent, as used elsewhere in this article.

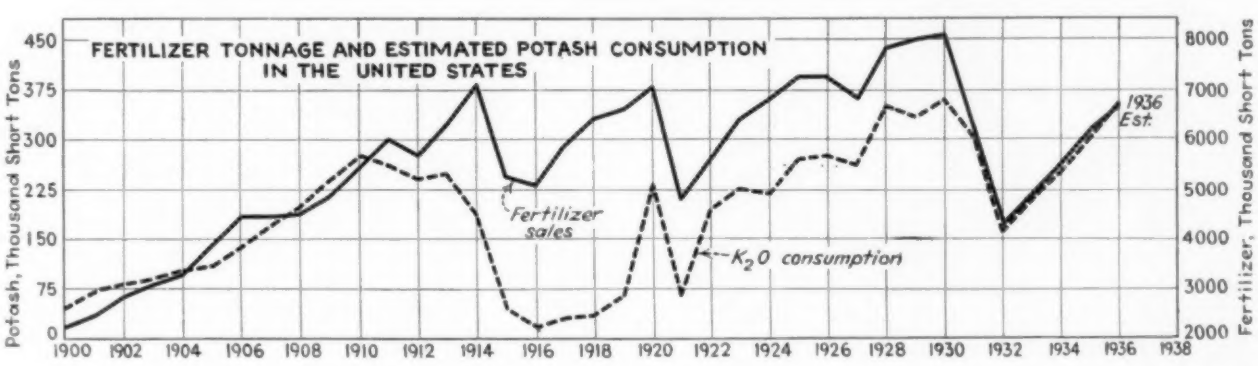
Data for other diagrams in this article are from American Potash Institute











During 1936 Union Potash and Chemical Co. started to dig a shaft near Carlsbad, New Mexico; but these operations were shortly interrupted. Two important producers in this area continuing operations were U. S. Potash Co. and Potash Co. of America. The latter during 1936 had its first full year of flotation "refinery" operation. The major producer of California continued to be American Potash and Chemical Co. Small quantities of potash were made from brines on the Salduro Marsh. Two important by-product potash recovery operations during 1936 were continued by U. S. Industrial Chemical Co. and North American Portland Cement Co.

It is estimated by American Potash Institute that deliveries of potash chemicals during 1936 contained approximately 360,000 tons of K_2O for fertilizer use and about 25,000 tons for miscellaneous chemicals. The slight excess of consumption over shipments is accounted for by the fact that during the latter part of 1936 there was some delay in movement of potash from the producing point to customers, principally a result of the longshoremen's strike. The fertilizer industry stock on hand is, however, not materially less than a year ago. The probable consumption of potash in 1937 is estimated in prospect as 8 to 10 per cent above last year.

World operations of the potash industry probably reached an all-time high for total sales during 1936. Marketing operations continued almost exclusively under the Cartel. Civil disturbances in Spain have not yet indicated any new affiliation or modified marketing plan for those Spanish enterprises which a few years back were the cause of a brief international price war.

Aggressive marketing has been continued by all American interests, including importers. The joint educational effort conducted through American Potash Institute has supplemented this apparently to good effect. One of the most important aspects of this joint work is the educational pressure for higher concentration fertilizers.

The old competition between sulphate and muriate has continued, but with little progress for the sulphate advocates. Only in the case of tobacco does the preponderance of evidence from agronomic tests show any large advantage. Hence the ratio between sulphate and chloride used remains fairly constant except as tobacco becomes more or less important relatively in determining total fertilizer consumption. The price differential of sulphate remains substantially unchanged.

The potash industry is not an important user of chemicals. It is rather a source of chemical raw material for chemicals makers whose output is reported by the U. S. Census of Manufactures. Of the imported material approximately 5 per cent now is used in the chemical industries. The major imported commodities so used, as reported for 1935 by the Bureau of Mines, are as follows:

Nitrate (saltpeter) crude........	13,626 short tons
Bitartrate (argols)...............	8,184
Chlorate and perchlorate........	7,159
Carbonate, crude or black salts..	2,063
Caustic........................	1,713
Nitrate (saltpeter) refined.......	748
All others......................	683
Total......................	34,176

Re:—Phosphoric Acid Costs

To the Editor of Chem. & Met.:

Sir:—In the recent paper by myself and associates, discussing cost of producing a concentrated superphosphate by the electric furnace method, there is a misprint and an error of calculation in the data regarding consumption and cost of electrode. The consumption of electrodes is 23 lb. per ton of P_2O_5 charged to the furnace, as stated correctly in an earlier paper. In calculating the cost of electrodes, a factor of 0.325 was omitted. All the electrode costs in Table VII, page 649, of the December, 1936, issue should be multiplied by 0.325. This reduces the total and the net costs shown in this table, and the cost items used in the discussion on page 650. The net cost per ton of available P_2O_5 is $45.26 per ton instead of $47.91 per ton.

HARRY A. CURTIS
Chief Chemical Engineer, Tennessee Valley Authority, Knoxville, Tenn.

ALKALI INDUSTRY

USED

SODA ASH

3,910,000 Tons	Salt (in brine)
3,135,000 Tons	Limestone
2,150 Tons	Ammonia

LIME SODA CAUSTIC

590,000 Tons	Soda Ash
700,000 Tons	Limestone

ELECTROLYTIC CAUSTIC SODA

514,000 Tons	Salt (mined or brine)
8,000 Tons	Soda Ash
48,000 Tons	Sulphuric Acid (50 deg.)

BICARBONATE OF SODA

86,000 Tons	Soda Ash

Chem. & Met. estimates

TO MAKE

SODA ASH

Soda Ash	2,413,694 Tons

LIME SODA CAUSTIC

Lime Soda Caustic	436,980 Tons

ELECTROLYTIC CAUSTIC SODA

Electrolytic Caustic Soda	321,563 Tons
Chlorine	319,303 Tons
Hydrogen	2,810,000 M.Cu.Ft.

BICARBONATE OF SODA

Bicarbonate of Soda	135,000 Tons

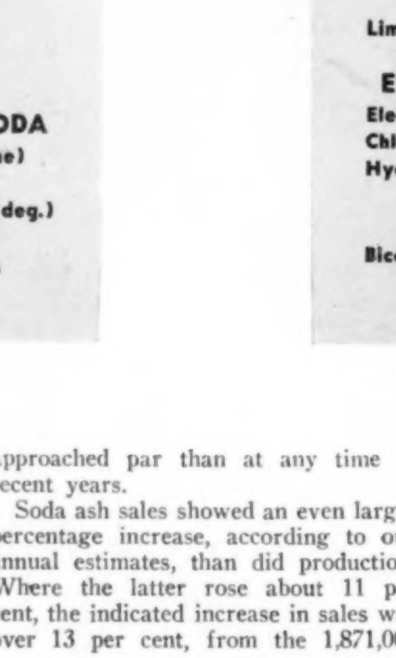
U. S. Census, 1935, and estimates

ONCE again the alkali industry has demonstrated that the three new soda ash plants built in the South during 1934 and 1935 were not an expression of unwarranted optimism on the part of what had otherwise been considered a conservative industry. As in the preceding year, a large part of the industry's soda ash capacity was employed, accounting in 1936 for an estimated production of some 2,778,000 tons, as compared with the 2,508,559 tons produced, according to Census reports, during 1935. Included in this total was about 100,000 tons of natural soda, as against the 94,865 tons of natural product produced in 1935. With output at this high level the 1929 record production of 2,682,216 tons was exceeded by 4 per cent, making 1936 the first year to pass the industry's previous banner year.

In the neighborhood of 40,000 tons annual capacity was added to the ammonia soda industry's capacity during 1936, while a small decrease in capacity took place in natural soda plants. With considerable old standby capacity discounted, the industry is today capable of a production of close to 3,340,000 tons in modern, useful equipment, so that 1936 production was at the rate of over 83 per cent of this modern capacity, a figure which more nearly approached par than at any time in recent years.

Soda ash sales showed an even larger percentage increase, according to our annual estimates, than did production. Where the latter rose about 11 per cent, the indicated increase in sales was over 13 per cent, from the 1,871,000 tons reported by the Census for 1935, to a 1936 total of 2,118,000 tons. This represents an increase of 60 per cent above the depression low in 1932, and more than 27 per cent above the total estimated for 1934. With 1929 sales considered as 100, the index for 1936 sales approaches 117, a remarkable record in view of the fact that general business is still about 25 per cent below 1929, according to an averaging of *Business Week's* weekly indices of business activity.

U. S. production for sale of principal ammonia-soda products



In general, the individual consuming industries which employ soda ash showed somewhat the same tendencies as the alkali industry itself, although the trend was mixed. The largest consumer, glass, had an excellent year, with the revival in building and the near-record in the automobile industry; a year which was, in fact, at least as good as 1929 for the industry as a whole, and better in some branches according to current indications. The glass business would have been even better had it not been for the serious strikes occurring during the latter part of the year. Even so, the indicated 17.5 per cent increase over 1935 is not out of line.

Still larger percentage increases in ash consumption occurred in some of the industries that are smaller consum-

ers than glass. Slightly over 24 per cent was the advance in miscellaneous uses and something like 20 per cent in cleansers and modified sodas. The manufacture of pulp and paper took about 12.5 per cent more ash while nearly a 10 per cent rise occurred in the use of ash in making chemicals. Of this latter, a considerable, but substantially constant, tonnage is going to the production of synthetic sodium nitrate, as has been noted in earlier *Chem. & Met.* reviews.

After having fallen off in 1935, use of ash in water softeners increased again in 1936, showing approximately an 8.5 per cent rise. Soap, an important user, found its business increased sufficiently to require over 8 per cent more ash. Exports increased slightly more than 1 per cent and petroleum refining showed little if any change, for though production increased, the use of ash was substantially static owing to the continuous decrease in unit requirements that has been occurring in recent years. Only the use in woolen textiles required less ash than the preceding year, which was a phenomenally good one in that industry, a decrease of about 8 per cent, occasioned by the fact that the output of woolens in 1936 returned to a more nearly normal level.

Estimated Distribution of Soda Ash Sales in the United States

Consuming Industries	1934 Short Tons (Revised)	1935 Short Tons (Revised)	1936 Short Tons
Glass	500,000	664,000	780,000
Soap	160,000	170,000	184,000
Chemicals	605,000	610,000	670,000
Cleansers and modified sodas	100,000	100,000	120,000
Pulp and paper	70,000	80,000	90,000
Water softeners	40,000	35,000	38,000
Petroleum refining	8,000	8,000	8,000
Textiles	28,000	48,000	44,000
Exports	33,000	43,500	44,000
Miscellaneous	119,000	112,500	140,000
Totals	1,663,000	1,871,000	2,118,000

Estimated Distribution of Caustic Soda Sales in the United States

Consuming Industries	1934 Short Tons (Revised)	1935 Short Tons (Revised)	1936 Short Tons
Soap	93,000	96,000	104,000
Chemicals	107,000	118,000	130,000
Petroleum refining	84,000	87,000	95,000
Rayon and cellulose film	147,000	160,000	174,000
Lye	36,000	38,000	46,000
Textiles	33,000	34,000	43,000
Rubber reclaiming	10,000	11,000	13,000
Vegetable oils	9,500	9,000	10,000
Pulp and paper	33,000	40,000	46,000
Exports	65,000	69,500	72,000
Miscellaneous	48,000	56,500	63,000
Totals	665,500	719,000	796,000

Caustic soda had a heartening year in 1936, for at least part of the slack between production and consumption that was noted in our review of 1935 was taken up by a marked improvement in consumption. In 1935, according to the Census, the total caustic production of 758,543 tons was made up of 436,980 tons produced by the lime-soda process and 321,563 tons of electrolytic caustic. For comparison, our 1936 estimates show a total of 825,000 tons produced, 456,000 tons in lime-soda plants and 369,000 tons by the electrolytic method. Where sales were 719,000 tons in 1935, they jumped to 796,000 tons in 1936. The decrease in discrepancy was not large, but it was a step in the right direction and it should be noted that it took place without reliance on new methods of chlorine production. So far as is known, the process mentioned last year for producing chlorine without caustic soda was not used commercially in 1936.

Production of Caustic Soda in the United States

(Short Tons)

Year*	Lime-Soda	Electrolytic	Total
1921	163,044	75,547	238,591
1923	314,195	122,424	436,619
1925	355,783	141,478	497,261
1927	387,235	186,182	573,417
1929	524,985	236,807	761,792
1931	455,832	203,057	658,887
1933	439,363	247,620	686,983
1935 (revised)	436,980	321,563	758,543
1936 (estimated)	456,000	369,000	825,000

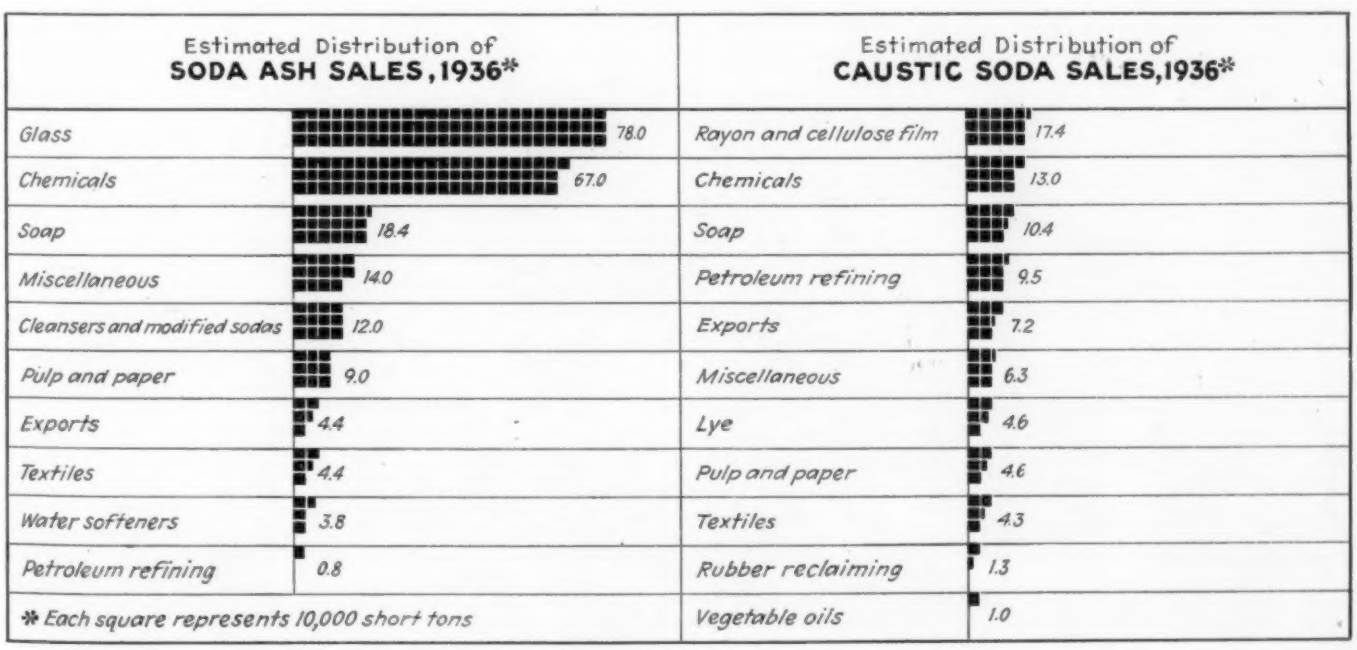
*Figures for 1921–1935 are from the U. S. Bureau of the Census. Electrolytic caustic soda figures do not include that made and consumed at wood-pulp mills, estimated at about 30,000 tons in 1927 and 1929, at about 24,000 tons in 1931, 21,000 tons in 1933, 20,000 tons in 1934, 17,000 tons in 1935 and 19,000 tons in 1936.

Caustic Soda Uses

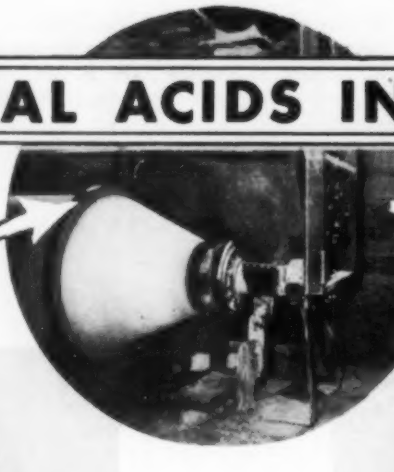
Every one of the major caustic consuming industries contributed to the better balance noted in the preceding paragraph. Owing to a large increase in the processing of cotton, the textile industry took about 26 per cent more than in 1935. Improved lye consumption was reflected in a 21 per cent increase in this industry. Rubber reclaiming showed an improvement estimated at over 18 per cent, while pulp and paper required about 15 per cent more than in the preceding year. Miscellaneous uses advanced over 11 per cent and uses in making chemicals, about 10 per cent.

Increasing activity in petroleum refining occasioned a 9 per cent increase in caustic consumption, while the record year in rayon and cellulose film

(Please turn to page 79)



MINERAL ACIDS INDUSTRY



USED	
SULPHURIC ACID	
848,000 Tons	Sulphur
565,000 Tons	Domestic Pyrites
445,000 Tons	Imported Pyrites
325,000 Tons	Byproduct Sulphur Dioxide
3,900 Tons	Anhydrous Ammonia
5,400 Tons	Sodium Nitrate
NITRIC ACID	
17,400 Tons	Sodium Nitrate
32,000 Tons	Sulphuric Acid (50°)
41,000 Tons	Anhydrous Ammonia
HYDROCHLORIC ACID	
104,000 Tons	Salt
139,000 Tons	Sulphuric Acid (50°)
16,900 Tons	Chlorine
500 Tons	Hydrogen
5,000 Tons	Nitre Cake
	Byproduct Gases

Chem. & Met. estimates

TO MAKE	
SULPHURIC ACID	
Sulphuric Acid (50°)	6,725,000 Tons
Nitre Cake	7,500 Tons
NITRIC ACID	
Nitric Acid (100%)	154,000 Tons
Nitre Cake	24,500 Tons
HYDROCHLORIC ACID	
Hydrochloric Acid (100%)	82,000 Tons
Byproduct HCl (100%)	5,000 Tons
Salt Cake	130,000 Tons

U. S. Census, 1935, (approx.), except sulphuric acid

SULPHURIC ACID is coming back! Despite the prophets who started burying it a number of years ago when consumption in fertilizers and petroleum refining, the two biggest uses, fell off considerably, this patriarch of the chemical tribe has remarkable recuperative powers. Losing a part of its hold in one field, it gains in another. In 1936, according to the *Chem. & Met.* estimates that accompany this article, sulphuric acid consumption returned to 90 per cent of the phenomenal 1929 rate, having increased by some 13 per cent over our revised figure for 1935.

In 1936, an actual shortage of sulphuric acid developed in the United States, particularly along the Atlantic seaboard, in the Middle West and in the far West. Production facilities were taxed, and a number of plants previously shut down were put into operation. For the first time since pre-depression days, considerable new acid plant construction was either completed or initiated. Two new Chemico sludge conversion plants were contracted for, and several acid concentrators. One new contact plant went into operation, another was substantially enlarged and contracts were signed for three more. In addition, American firms were retained to construct a number of foreign plants. To the considerable surprise of acid men, construction of an old style chamber plant was undertaken during the year by a fertilizer producer located in an eastern state.

Preliminary estimates indicate that consumption of sulphuric acid surpassed that of every previous year with the sole exception of 1929. In this connection, attention is called to the accompanying tabulation which lists production in each of the years since 1911. There was probably some small decrease in stocks during 1936, but stocks are never large and it is substantially correct to consider that production and consumption were equal. On this basis, the 7,620,000 short tons of acid (50-deg. Bé. basis) estimated to have been made and consumed, sur-

Production of Sulphuric Acid in the United States

(Thousands of short tons, 50 deg. Bé.)

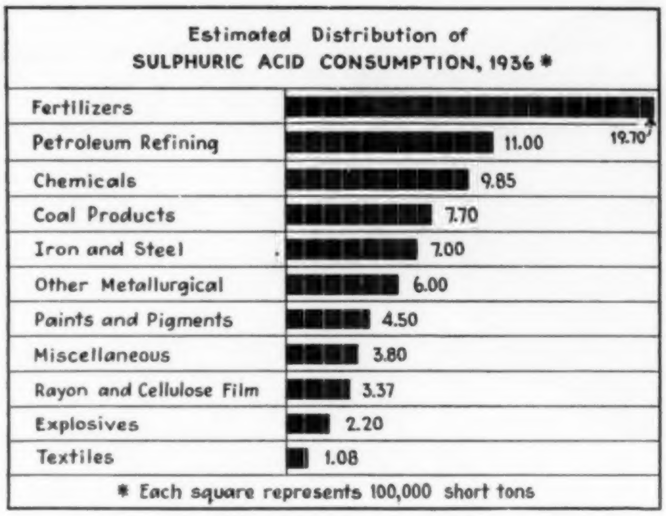
Year	Production	Year	Production
1911	2,700[1]	1924	6,180[4]
1912	2,950[1]	1925	7,004[3]
1913	3,575[1]	1926	7,168[4]
1914	3,800[1]	1927	7,336[3]
1915	4,170[1]	1928	7,225[4]
1916	6,300[1]	1929	8,491[3]
1917	7,200[1]	1930	7,625[4]
1918	7,450[2]	1931	6,085[3]
1919	5,402[3]	1932	4,650[4]
1920	6,040[4]	1933	5,475[5]
1921	4,370[3]	1934	6,166[4]
1922	4,000[4]	1935	6,725[5]
1923	6,556[3]	1936	7,620[4]

[1] U. S. Geological Survey.
[2] War Industries Board.
[3] U. S. Census.
[4] *Chem. & Met.* estimate.
[5] *Chem. & Met.* estimate; 1933 Census included only acid made for sale; 1935 Census gives 6,462,000 tons.

Estimated Distribution of Sulphuric Acid Consumed in the United States

(Basis, 50 deg. Bé.)

Consuming Industries	1934 Short Tons (Revised)	1935 Short Tons (Revised)	1936 Short Tons
Fertilizer	1,650,000	1,730,000	1,970,000
Petroleum refining	1,100,000	980,000	1,100,000
Chemicals	910,000	940,000	985,000
Coal products	500,000	625,000	770,000
Iron and steel	475,000	630,000	700,000
Other metallurgical	400,000	520,000	600,000
Paints and pigments	330,000	400,000	450,000
Explosives	180,000	175,000	220,000
Rayon and cellulose film	256,000	309,000	337,000
Textiles	75,000	90,000	108,000
Miscellaneous	290,000	326,000	380,000
Totals	6,166,000	6,725,000	7,620,000



passed the 1934 estimate by over 19 per cent, while it topped 1935 by 13.2 per cent. Where in 1935, an estimated 773,000 long tons of sulphur was consumed for acid, the corresponding 1936 figure is believed to be 937,000 long tons. Of the estimated 1936 sulphur shipments of 1,965,000 long tons, approximately 540,000 tons was taken by exports, and 513,000 tons by non-acid uses. In 1935 the corresponding figures were: shipments, 1,634,990 long tons; exports, 413,299 tons; and non-acid uses, 450,000 tons. Other raw materials for sulphuric acid in the two years appear to have included, in 1935, 504,825 long tons of domestic and 397,113 tons of imported pyrites; and in 1936, an estimated 528,000 tons of domestic and 350,000 tons of imported pyrites. In 1935, the byproduct acid produced at copper and zinc smelters was reported as 754,534 short tons (50 deg.), and for 1936, this production has been estimated at 843,000 tons.

Acid use is believed to have increased during the year in every important consuming field, with the largest tonnage increase in fertilizers, and the biggest percentage advance in explosives. Increased ammonium sulphate production brought the coal products classification near the top of the list of percentage increases, followed by textiles, miscellaneous uses and "other metallurgical." Superphosphate production increased sharply, up somewhere between 15 and 18 per cent according to trade reports, and the highest output since 1930. With notable increases in titanium pigment manufacture, acid consumption in the paint and pigment field has risen materially. In petroleum refining, the trend evident in 1935 appears to have reversed, and reports that the new solvent refining processes have not reduced acid requirements as much as was expected indicate acid consumption higher by slightly more than the increase in refining. That the rise in acid consumption for rayon and cellulose film was not larger than shown, is chargeable to the fact that the industry could have sold and produced more—but lacked the capacity.

Technical developments of several sorts have had acid circles in a quandary for a year or more. Not the least of the questions to which definite answers cannot be given is this matter of new byproduct sulphur sources. In Canada, 20-30 tons per day of elemental sulphur is being recovered from smelter gases by a new process, which it is believed could not compete with mined sulphur, except for the unusual circumstances of the installation. A new sodium phenolate purification plant for refinery gases at El Segundo, Calif., is recovering H_2S for sulphuric acid manufacture, while similar plants for the same purpose have been contracted for at Philadelphia and Wayne, W. Va. A coal concern in Kansas is removing pyrite from coal by an improved metallurgical concentration process and selling it to a contact plant operator in an adjoining state, while not long ago the lay press, misinterpreting a scientific discussion of a small scale, experimental flue gas purification process, envisioned for the near future a veritable gold mine of byproduct sulphur, obtainable by the "air conditioning" of power plant stack gases.

At the top of the preceding page is a tabulation of estimates of raw materials believed to have gone into the indicated quantities of mineral acids produced in 1935. Production shown for sulphuric acid is about 4 per cent higher than the 1935 Census of Manufactures. Although our figure may be somewhat too high, trade opinions indicate that it should be even higher. Production of both nitric and hydrochloric acids as shown in the tabulation has been adjusted to agree with the Census, the first figure, however, including the nitric acid believed to be present in the mixed acid reported by the Census.

(Continued from page 77)

required a substantial increase in caustic tonnage which was nearly 9 per cent above 1935. As in the case of soda ash, the additional caustic requirement in the soap industry was approximately 8 per cent, while another increase, slightly over 3.5 per cent, occurred in the exportations of this material.

So far as it has been possible to determine, the recovery of caustic soda in the production of rayon and cellulose film did not increase materially, in percentage of total requirements, over 1935. In the preceding year the industry had become actively aware of the possible 36 per cent recovery of caustic which could be effected through the use of dialyzers. With the new recovery installations made during 1935, combined with those already in operation, it was estimated at the close of that year that approximately 18 per cent of the usual caustic requirement was being saved through dialysis.

U. S. Production of Soda Ash

(Preliminary figures, U. S. Census of Manufactures, 1935)

	1935	1933
Number of establishments	17	11 [1]
Total production, short tons	2,508,559	2,317,011
Made and consumed in same establishments, tons	637,224	662,983
For sale—		
Tons	1,871,335	1,654,028
Value	$28,424,750	$24,182,681
For sale, by process:		
Ammonia-soda:		
Number of establishments	9	6
Tons	1,776,470	1,585,633
Value	$27,212,035	$23,163,690
Natural and electrolytic soda:		
Number of establishments	8	3 [2]
Tons	94,865	68,395 [2]
Value	$1,212,715	$1,018,991 [2]

[1] Includes two establishments reporting no soda ash for sale.
[2] Natural process only.

U. S. Production of Caustic Soda and Chlorine

(Preliminary figures, U. S. Census of Manufactures, 1935)

	1935	1933
Sodium hydroxide (caustic soda):		
Number of establishments	29	27
Total production, short tons [1]	758,543	686,983
Made and consumed in same establishments, tons	39,087	42,252
Made for sale—		
Tons	719,456	644,731
Value	$28,104,631	$24,478,385
By process:		
Electrolytic:		
Number of establishments	21	21
Total production, tons	321,563	247,620
Made and consumed in same establishments, tons	34,797	39,114
Made for sale—		
Tons	286,766	208,506
Value	$11,233,704	$8,683,911
Lime-soda:		
Number of establishments	11	9
Total production, tons [2]	436,980	439,363
Made and consumed in same establishments, tons	4,290	3,138
Made for sale—		
Tons	432,690	436,225
Value	$16,870,927	$15,794,474
Chlorine:		
Number of establishments	21	20 [3]
Total production, tons [4]	319,303	217,089 [3]
Made and consumed in same establishments, tons	112,144	92,526 [3]
Made for sale—		
Number of establishments	18	16
Tons	207,159	124,563
Value	$7,944,266	$4,486,325

[1] Not including caustic soda made and consumed in wood-pulp and textile mills.
[2] Includes two establishments making caustic from natural soda.
[3] Revised from 1933 census.
[4] Not including chlorine made and consumed in wood-pulp mills; in 1929 total production was 199,472 tons, in 1931 180,870 tons of chlorine.

THE EXPLOSIVES INDUSTRY

USED TO MAKE

- 6,500 Tons Sulphur
- 5,100 Tons Charcoal
- 65,970 Tons Sodium Nitrate
- 31,417 Tons Nitroglycerine
- 1,288,000 Lb. Nitrotoluol
- 666,000 Lb. Nitrocellulose
- 23,489 Tons Ammonium Nitrate
- 1,595,000 Lbs. Antacid
- 7,400 Tons Wood Pulp
- 3,400 Tons Paraffin
- 4,200 Tons Paper

Permissible High Explosives	39,170,016 lb.
All Other High Explosives	200,323,559 lb.
Granular Black Blasting Powder	34,222,625 lb.
Pellet Black Blasting Powder	34,665,050 lb.
Total	308,381,250 lb.

U. S. Bureau of Mines, Rept. of Inv. 3317

MANUFACTURE of explosives, as defined by the United States Bureau of Mines includes all establishments engaged in the production of black blasting powder, dynamite, and so-called permissible and other high explosives. Coal mines consumed 89 per cent of the blasting powder and 99 per cent of the total output of permissible explosives and 11 per cent of the output of other high explosives in 1935. Metal mines used 28 per cent of all explosives other than permissibles while the construction industry used 40 per cent in addition to 6 per cent of the black blasting powder.

Manufacturers reporting to the Bureau of Mines on the sale of explosives, do not show the quantities of the various constituents used. Because it is of considerable interest to know approximately how much sulphur, sodium nitrate, nitroglycerin and other chemical raw materials are consumed, the Bureau requested J. E. Crawshaw, explosives engineer of the Pittsburgh Experiment Station, to analyze the sales figures and prepare the estimates shown in the accompanying table (from U. S. Bureau of Mines, Reports of Investigations 3317, Nov. 1936).

In 1935 according to the Bureau, the explosives plants making black blasting were operated at 37.6 per cent of their rated capacity and the mills making permissible and other high explosives were operated at 43.9 per cent of their rated capacity.

Estimated Quantities of Certain Materials Used in Explosives Consumed in the United States During 1935, in Pounds

Materials	Black Powder		Permissibles	Other High Explosives	Total
	Granular	Pellet			
Sulphur	4,449,000	4,394,000	....	4,158,000	13,001,000
Charcoal	5,134,000	5,070,000	....	....	10,204,000
Sodium nitrate	24,640,000	24,335,000	2,330,000	80,633,000	131,938,000
Nitroglycerin	....	....	3,763,000	59,071,000	*62,834,000
Nitrotoluenes	....	....	....	1,288,000	1,288,000
Nitrocellulose	....	....	....	666,000	666,000
Ammonium nitrate	....	....	25,626,000	21,352,000	46,978,000
Antacid	....	....	179,000	1,416,000	1,595,000
Wood Pulp	....	....	2,553,000	12,287,000	14,840,000
Paper	....	520,000	1,665,000	6,200,000	8,385,000
Paraffin	....	346,000	1,665,000	4,958,000	6,969,000
Total	34,223,000	34,665,000	37,781,000	192,029,000	298,698,000
Absorbents other than wood pulp, moisture, and other compounds	....	....	1,389,000	8,294,000	9,683,000
Total Sales	34,223,000	34,665,000	39,170,000	200,323,000	308,381,000

* Nitroglycerin contains nitroglycerin, nitropolyglycerin, nitrosugar, and ethylene glycol dinitrate (approximately 15,000,000 lbs. in 1935).

Manufacturers of Explosives

(B, black powder; H, high explosives other than permissibles; P, permissibles)

- H....... Apache Powder Co., Benson, Ariz.
- B, H, P.. Atlas Powder Co., Wilmington, Del.
- B, H, P.. Austin Powder Co., Cleveland, Ohio.
- H....... C. E. Bedient, Cincinnati, Ohio.
- H, P..... Burton Explosives Division of American Cyanamid & Chemical Corporation, Cleveland, Ohio.
- H....... Dixie Torpedo Co., Owensboro, Ky.
- B, H, P.. E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.
- B....... Egyptian Powder Co., East Alton, Ill.
- B....... Equitable Powder Manufacturing Co., East Alton, Ill.
- H, P..... General Explosives Division of American Cyanamid & Chemical Corporation, Latrobe, Pa.
- H....... Grange Powder Co., Seattle, Wash.
- H....... Halafax Explosives Co., Los Angeles, Calif.
- B, H, P.. Hercules Powder Co., Wilmington, Del.
- H, P..... Illinois Powder Manufacturing Co., St. Louis, Mo.
- B....... King Powder Co., Cincinnati, Ohio.
- H, P..... Liberty Powder Co., Pittsburgh, Pa.
- H....... Southern Explosives Co., Embreeville, Tenn.
- H....... Titan Explosives Co., Portland, Oreg.
- H....... Trojan Powder Co., Allentown, Pa.
- B....... United States Powder Co., Terre Haute, Ind.
- H....... West Coast Powder Co., Everett, Wash.
- B....... Western Powder Manufacturing Co., Peoria, Ill.

ORGANIC CHEMICALS INDUSTRY

USED TO MAKE

70,000 Tons	Acetylene
4,250 Tons	Ammonia, anhydrous
75,500 Tons	Caustic Soda
79,000 Tons	Chlorine, (100%)
80,500 Tons	Hydrochloric Acid (18 deg.)
71,000 Tons	Iron Borings
17,000 Tons	Lime
26,000 Tons	Mixed Acid
17,000 Tons	Nitric Acid (40 deg.)
25,500 Tons	Soda Ash
207,000 Tons	Sodium Chloride
210,000 Tons	Sulphuric Acid (50 deg.)
20,500 Tons	Zinc Dust

Chem. & Met. estimates

Acetic Acid (100%)	103,000 Tons
Aniline Oil	16,286 Tons
Carbon Tetrachloride	27,898 Tons
Dichlorobenzene	4,867 Tons
Dyes, Coal Tar	50,966 Tons
Intermediates, Coal Tar	218,328 Tons
Medicinals	5,011 Tons
Nitrobenzene	24,081 Tons
Phenol	21,709 Tons
Phthalic Anhydride	11,710 Tons
Rubber Chemicals	11,940 Tons
Synthetic Resins	45,451 Tons

Chem. & Met. estimates

IN 1936 THE organic chemicals industry looked to coal-tar crudes (benzol, creosote oil and naphthalene) as starting raw materials for about 15 per cent of its estimated 1,043,000 tons of finished products. The remaining 85 per cent was built up chiefly from carbon monoxide, acetylene, and petroleum and natural gas hydrocarbons. Add to these primary materials the important auxiliaries listed at the top of this page, as well as about 40 other chemicals consumed in appreciable quantities, and the total will afford some idea of the vast raw materials supply upon which this rapidly growing industry draws.

Hence it has been with a noticeable effect on the entire chemical industry that finished organic chemicals went from a production index number of 100 in 1929 to one greater than 250 in 1936. Most of this jump is represented by a near threefold increase in the non-coal-tar class. This division came up from 316,500 tons in 1929 to 795,500 tons in 1935 and an estimated 890,000 tons in 1936. Only in 1930 and 1931 did it fall below its 1929 level. Coal-tar chemicals, while overshadowed by this great increase in the other side of the organic field, nevertheless have shown a favorable upward trend. Domestic output, including dyes, went from 83,500 tons in 1929 to 136,400 tons in 1935 and an estimated 153,000 tons in 1936.

A notable trend in the synthetic organic field has been the increasing tendency toward tailor-made products. Research laboratories are turning out more new industrial products made to measure to pre-determined specifications. The old order of discovering a new product and then finding a use for it is rapidly giving way to a more intelligent application of our knowledge of chemistry in building up new products from available raw materials to meet already existing needs. Particularly in organic chemistry is it possible to outline in advance many complicated syntheses and build up step by step a new substance whose properties can be foretold. Improved high pressure and high temperature technology have been important factors in making this possible industrially.

Acute shortage of naphthalene continued from 1935 into 1936, and it was not until late in the year that increased domestic production, stimulated by ris-

Comparison of Production and Sales of Dyes and Organic Chemicals

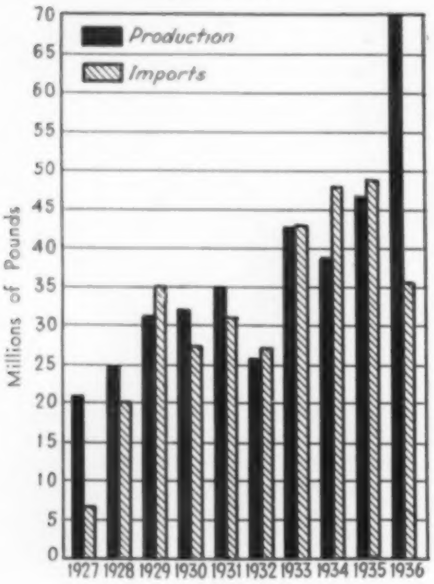
	1925–30 Average	1933	1934	1935	Increase 1935 Over 1934 Per Cent
Coal-tar intermediates:					
Production, 1,000 lb.	267,492	370,754	407,728	460,537	12.9
Sales, 1,000 lb.	109,133	163,683	174,664	207,307	18.6
Sales value, $1,000	22,408	23,705	27,033	32,536	20.4
Finished coal-tar products: [1]					
Production, 1,000 lb.	138,078	[3] 176,206	[2] 186,982	[3] 248,847	33.0
Sales, 1,000 lb.	133,964	[3] 162,092	[2] 167,632	[3] 213,991	27.7
Sales value, $1,000	65,027	[3] 68,993	[2] 76,214	292,330	21.1
Dyes:					
Production, 1,000 lb.	94,003	100,953	87,178	101,933	16.9
Sales, 1,000 lb.	92,207	98,238	84,309	97,954	16.2
Sales value, $1,000	39,428	43,102	43,251	51,488	19.0
Medicinals:					
Production, 1,000 lb.	4,508	8,715	10,024	10,023	0.0
Sales, 1,000 lb.	4,106	8,070	8,224	8,950	8.8
Sales value, $1,000	7,464	6,828	7,922	8,372	5.7
Flavors and perfume materials:					
Production, 1,000 lb.	3,966	3,159	4,168	4,364	4.7
Sales, 1,000 lb.	3,919	2,965	3,695	4,080	10.4
Sales value, $1,000	2,901	2,484	3,028	3,172	4.8
Resins:					
Production, 1,000 lb.	[4] 24,442	[3] 41,628	[2] 56,059	[3] 90,913	62.2
Sales, 1,000 lb.	[4] 22,135	[3] 31,658	[2] 43,351	[3] 65,923	52.1
Sales value, $1,000	[4] 7,756	[3] 7,239	[2] 10,127	[3] 12,777	26.2
Non-coal-tar organic chemicals:					
Production, 1,000 lb.	280,993	771,575	1,133,644	1,591,896	40.0
Sales, 1,000 lb.	201,548	542,679	640,000	791,760	24.0
Sales value, $1,000	36,600	55,604	72,833	86,334	18.0

[1] Includes color lakes, photographic chemicals, rubber chemicals and other miscellaneous coal-tar products not shown separately.
[2] Does not include coumarone, indene and sulphonamide resins.
[3] Does not include coumarone and indene resins.
[4] 1927–30 average.

ing prices, relieved the situation. This increase, together with the German embargo on exports, resulted in an excess of domestic production over imports of this commodity last year for the first time since 1931. The outlook for 1937 is toward even greater independence of foreign sources. With further German export curtailment upon expiration of existing contracts, foreign supply will probably drop again next year. It is doubtful if the other major producing countries, Czechoslovakia, Poland, U.S.S.R. and the United Kingdom, can make up for much more loss in German supply. Domestic production, with further resumption of coking operations in the steel industry and with support of continued activity in the xylol, toluol and cresylic acid markets, may approach 100,000,000 lb. next year, according to U. S. Tariff Commission forecasts.

Production vs. Imports in Naphthalene

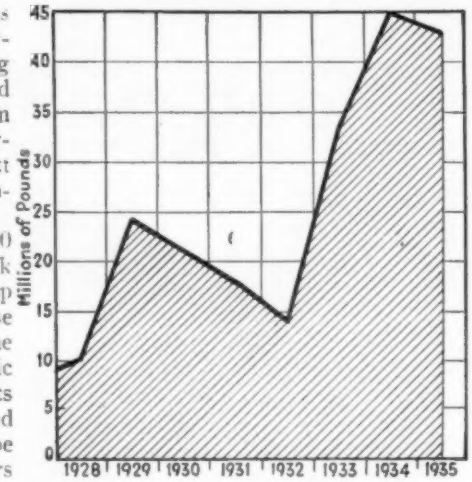
(Chemical Division, Department of Commerce)



Dyes from coal tar went to 51,000 tons in 1935, bringing production back to its 1933 level after a 7,000-ton drop in 1934. Estimates for 1936 came close to the 1929 high of 56,000 tons. The weighted price average of all domestic dyes sold has increased from 43.2 cents per lb. in 1929 to 51 cents in 1934 and 53 cents in 1935. While this may be partially a result of economic factors it more significantly represents a trend of demand for the better and more fast colors. Textile people are continually pushing unreliable and cheap dyes lower in the quality range of their finished products.

Ethylene and propylene from petroleum and natural gas continue to increase in importance as organic raw materials (see Jan. 1937, p. 18).

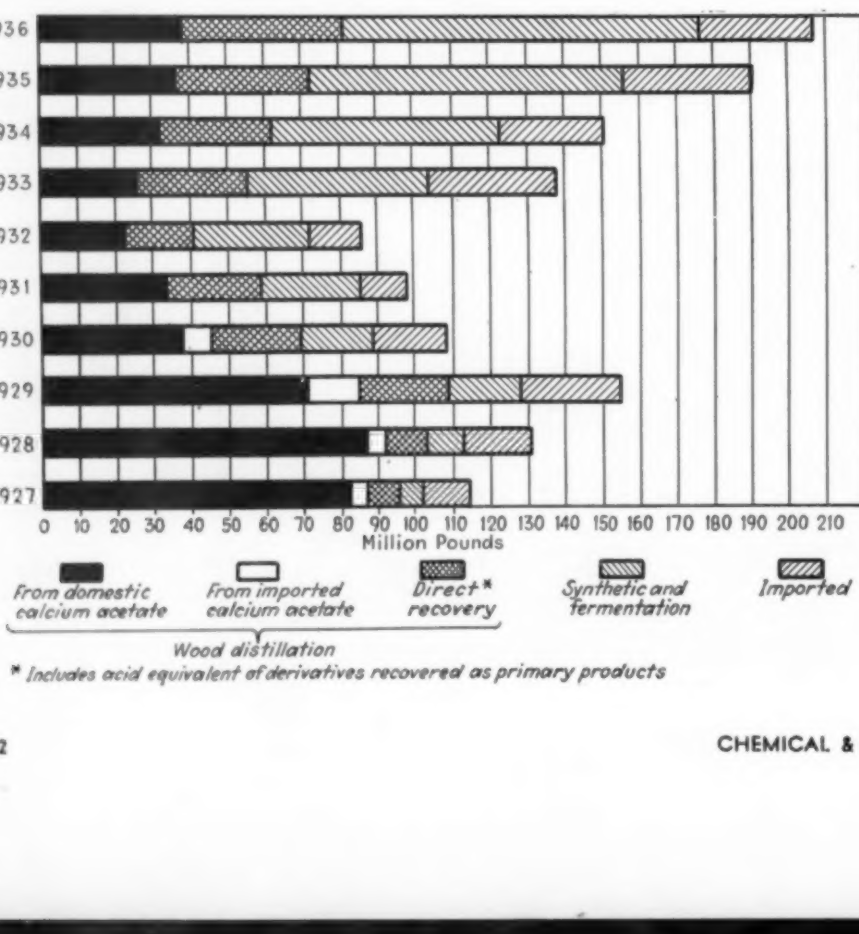
A number of years ago it appeared that some of the makers of manufactured gas were to embark on a general industrial chemicals program. The feeling that they had in their works abundant supplies of ethylene, propylene, and related unsaturated chemicals, naturally inspired the thought that these could be processed further into organic synthetics. However, a study of the economics of chemicals manufacture has apparently convinced gas and coke men that these would be unprofitable ventures. The necessity for large new investments and the need for elaborate specialized research and marketing staffs indicate why these particular fields are not attractive to a group which has fuel processing as its prime objective.



Eight Years of Phenol Production in U. S.

(Chemical Division, Department of Commerce)

Imports and Production Trends in Acetic Acid



Acetic Acid

As will be seen from the accompanying graph, this commodity is one which has shown a tremendous production increase in the last four years. Most of the growth has been in the synthetic process wherein the acid is derived through acetaldehyde from acetylene. Direct recovery from wood distillation has also shown some increase. Two wood distillers changed over from the calcium acetate method to the direct method of recovery in 1935, and were followed by three more in 1936. It is very probable that at least two more will make a similar change in 1937.

At least one industrial producer is making large amounts of acetic anhydride, acetic acid and aceto-derivatives from ketene synthesized from propylene, (see Jan. 1937, p. 21). Ketene, a relatively new industrial product, has the formula CH_2:CO, is extremely reactive, and might be described as a superanhydride of acetic acid.

Please note in comparing the acetic acid figures on this page with those included in the Bureau of Census report on page 106 that the latter include only the reported sales of acetic acid while the former are based upon total production of acetic acid including acid equivalents of derivatives where these were the primary recovery products. A number of producers are now making acetic anhydride, ethyl acetate and other aceto-derivatives directly without going through the acetic acid stage.

TEXTILE PROCESSING INDUSTRY

USED

83,000,000 Lb.	Dyestuffs
150,000,000 Lb.	Starch
185,000 Tons	Soap
90,000 Tons	Sulphuric Acid (50 deg.)
34,000 Tons	Caustic Soda
48,000 Tons	Soda Ash
23,500 Tons	Acetic Acid (28%)
10,000 Tons	Chlorine
15,000 Tons	Other Bleaches
92,000 Tons	Sodium Sulphate
21,000 Tons	Sodium Phosphates

$200,000,000 Estimated Total All Chemicals Used

TO MAKE

Values Added to Products Through Bleaching, Dyeing, Printing and Finishing Processes

Cotton Piece Goods	$200,000,000
Woolen and Worsted	150,000,000
Hosiery & Knitgoods	140,000,000
Rayon & Silk	100,000,000
Raw Stock & Yarns	85,000,000
Carpets, Felts and Miscellaneous	75,000,000
Total Values Added	$750,000,000

Chem. & Met. and Textile World estimates

TEXTILES hold a leading place among the chemical consuming industries, both in volume of consumption and variety of products used. Exclusive of rayon, which is itself essentially a chemical product, it is estimated that at least $200,000,000 worth of chemicals are used annually in the textile industry. Principal chemical operations are those of dyeing, bleaching, printing and finishing of cotton, woolen and worsted, rayon and silk, hosiery and knitgoods, carpets and felt products. *Textile World* estimates that one or more of these operations is carried out in 40 per cent of the textile mills in which over 150,000 workmen are employed. The values thus added to textile products in the dyeing and finishing processes approaches a billion dollars annually in normal times.

Except for dyestuffs, for which the United States Tariff Commission annually collects statistics of production, sales, imports and exports, there are no official sources for reliable information on the consumption of chemicals in the textile industry. Estimates have been published occasionally by *Chem. & Met.* and *Textile World* for a limited number of commodities but it has not been possible to trace the year-by-year trends. Table I lists available estimates for some of the more important chemicals used by the textile industries in 1935. The source of the estimate is noted in each case. For dyestuff consumption, the total has been calculated from the United States Tariff Commission data by using the statistician's favorite formula of adding imports to production and subtracting the exports.

In a study of the "Textile Industries in the Last Half of 1935," recently completed by the Federal Trade Commission, cost data were obtained from several hundred companies in the cotton textile industry engaged in dyeing and finishing processes. The costs of "dyes and chemicals" in relation to other items in the total mill costs are shown in this study to vary between one per cent and 30 per cent of total mill cost of finished textiles. Eighty-seven companies engaged in commission dyeing and finishing spent $9,227,065 annually for textile dyes and chemicals.

Current trends in the use of new dyes and chemicals were recently reviewed by Winn W. Chase, (see *Textile World*, Nov. 1936) who reaches this significant conclusion: "Recent chemical developments afford the textile processor unprecedented opportunities for improving existing operations and for creating new finishes and even new textiles far superior to any which have been available in the past. If the textile industry is

Table I. Estimated Consumption of Some of the Principal Chemicals Used in the Dyeing and Finishing of Textiles

Commodities	Est. Consumption	Value	Source of Estimates
Dyestuffs	83,000,000 lb.	$50,600,000	U.S.T.C.
Soaps, cleansers & kiering compounds	185,000 tons	30,000,000	T.W.
Starch	150,000,000 lb.	4,500,000	T.W.
Caustic Soda	68,000,000 lb.	1,768,000	C.&M.
Soda Ash	96,000,000 lb.	1,200,000	C.&M.
Sulphuric Acid 50 deg	90,000 tons	900,000	C.&M.
Acetic Acid (28%)	47,000,000 lb.	1,120,000	T.W.
Muriatic Acid 20 deg	60,000,000 lb.	700,000	T.W.
Chlorine	19,500,000 lb.	680,000	T.W.
Sodium Bicarbonate	10,000,000 lb.	700,000	C.& M.
Sodium Sulphate	184,000,000 lb.	1,840,000	C.& M.
Sodium Silicate	16,000,000 lb.	120,000	T.W.
Sodium Chloride	80,000,000 lb.	480,000	C.& M.
Lime	10,000,000 lb.	50,000	C.& M.
Oxalic Acid	1,200,000 lb.	130,000	C.& M.
Bichloride of Tin	650,000 lb.	160,000	T.W.
Bleaching Powder	30,000,000 lb.	600,000	T.W.
Disodium Phosphate	42,000,000 lb.	1,092,000	T.W.
Sodium Hydrosulphate	8,000,000 lb.	1,840,000	T.W.
Tannic Acid	1,000,000 lb.	230,000	T.W.
Tin Tetrachloride (45%)	11,000,000 lb.	2,030,000	T.W.
Turkey Red Oil	10,000,000 lb.	900,000	T.W.
Alum	10,000,000 lb.	350,000	C.& M.
Textile & Dye Assistants	1,656,569 lb.	502,000	U.S.T.C.
	Total	$102,500,000	

Table II. Dyestuffs Production, Imports and Exports in Pounds According to the United States Tariff Commission

Year	No. of Plants	PRODUCTION, Quantity	IMPORTS, Quantity	EXPORTS Quantity
1914	7	6,619,729	45,950,895	356,919*
1917	81	45,977,246	....	11,709,281
1918	78	58,464,446	....	15,265,710
1919	90	63,402,194	....	15,728,499
1920	82	88,263,776	3,402,582	29,823,591
1921	74	39,008,690	4,252,911	6,270,139
1922	87	64,632,187	3,982,631	3,976,443
1923	88	93,667,524	3,098,193	8,344,187
1924	78	68,679,000	3,022,539	17,924,200
1925	75	86,345,438	5,209,601	15,713,421
1926	61	87,978,624	4,673,196	25,799,889
1927	55	95,167,905	4,233,046	26,770,560
1928	53	96,625,451	5,351,951	27,824,264
1929	54	111,421,505	6,437,147	34,130,325
1930	50	86,480,000	4,114,882	28,267,340
1931	..	83,526,000	4,736,712	20,312,768
1932	..	71,269,000	3,903,236	16,096,824
1933	46	100,952,778	4,288,214	18,740,356
1934	43	87,178,000	4,240,000	17,942,203
1935	40	101,932,661	4,606,000	19,631,000

* 1914-1922 figures are in dollars since the quantities of dyes exported prior to 1922 were not recorded.

to take the fullest advantage of these developments, it must do several things. It must cooperate with the chemical companies in planning new applications for these chemicals; it must work with the machine builders in designing equipment to utilize these chemicals; and it must adopt a sound and vigorous merchandising policy which will bring to the attention of the consumer the advantages of the new finishes and new textiles made possible through the use of these chemicals."

In referring to the newer detergents made from fatty alcohol derivatives, Chase estimated that their consumption in 1936 practically doubled that of the preceding year. Sales of finishing compounds of the fatty alcohol sulphate type were 300 per cent greater in 1936 than in the preceding year and a further substantial increase is expected in 1937. It is significant that these products find application in textile processes where existing materials cannot be employed as effectively. Sodium hexametaphosphate is coming into widespread use in textile processes where lime and magnesium soap spots were formerly a source of danger.

Competing with starch and dextrine are the newer gelatine-base sizing compounds which are used for practically all acetate yarns and for perhaps 60 per cent of the viscose in warps. New sizing compounds especially suitable for staple rayon are being developed.

For fiber lubricants the industry formerly employed animal and vegetable oils exclusively and more recently the solubleized mineral oils. Lately, new synthetic organic chemicals have been introduced which will permit the fulling, carbonizing, dyeing and finishing operations to be carried out without scouring the yarn or fiber. Despite relatively higher costs, a wide use is predicted. Various organic solvents are finding application in conjunction with soap and sulphonated oil in de-gumming, scouring, kier-boiling and similar operations. These materials are also expected to be employed much more extensively in the future.

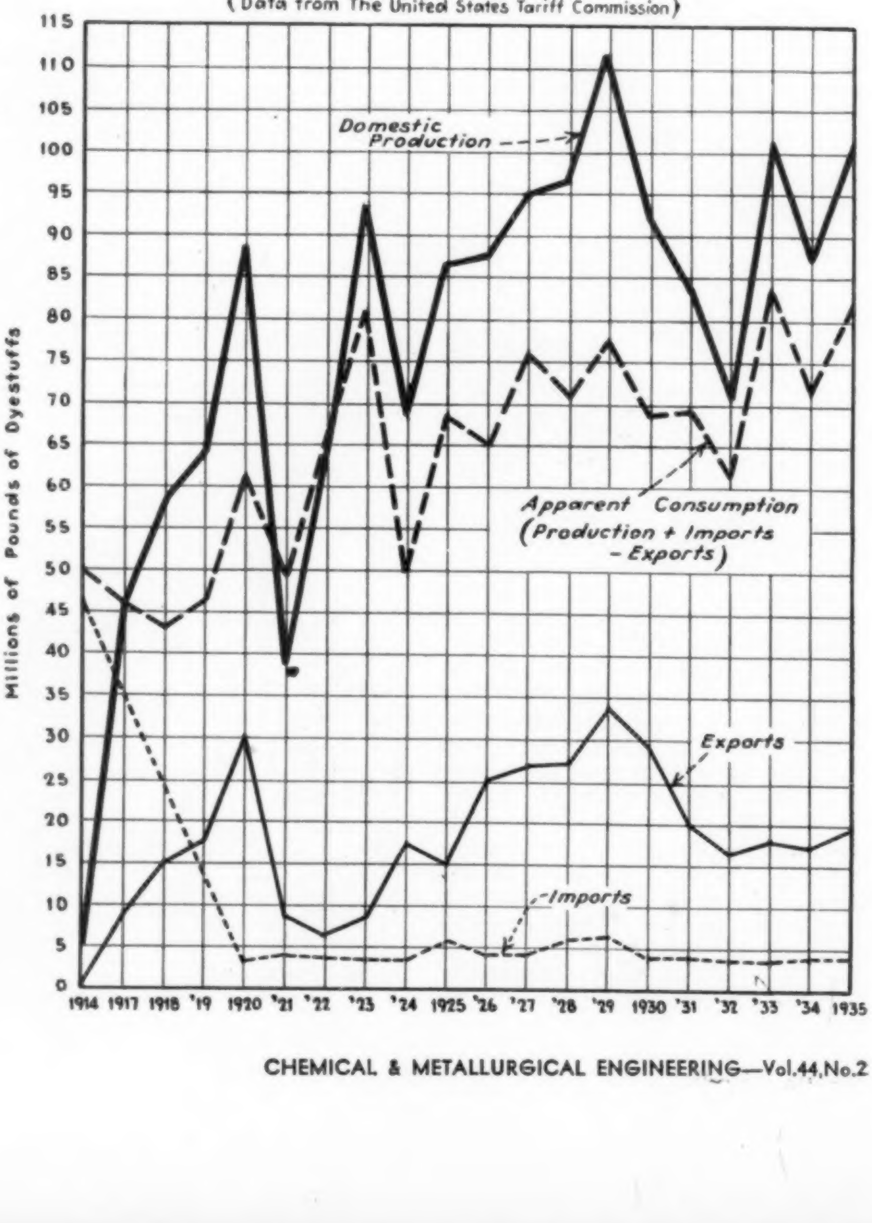
Rubber latex widely used in certain elastic yarns, in backing carpets and other pile fabrics and in the manufacture of automobile tire cords, has shown a 35 to 40 per cent increase during each of the last five years. Imports have jumped from 700,000 gal. in 1924 to about 12,000,000 gal. valued at over $5,000,000.

Synthetic resins are beginning to be used to produce crease-resistant and water-proof finishes on silk and rayon. Other resins are used to produce wool-like finishes on staple rayon and abrasion-resistant finishes on a variety of textiles. Despite the fact that rubber and pyroxylin coated fabrics have given way to steel in the tops of the newer automobiles, the production of coated fabrics in the finishing industry has started to climb. The Census reports that the amount of pyroxylin so spread in the first ten months of 1936 amounted to 51,194,333 lb. compared with 43,516,986 lb. and 36,359,576 lb. for comparable periods in 1935 and 1934 respectively.

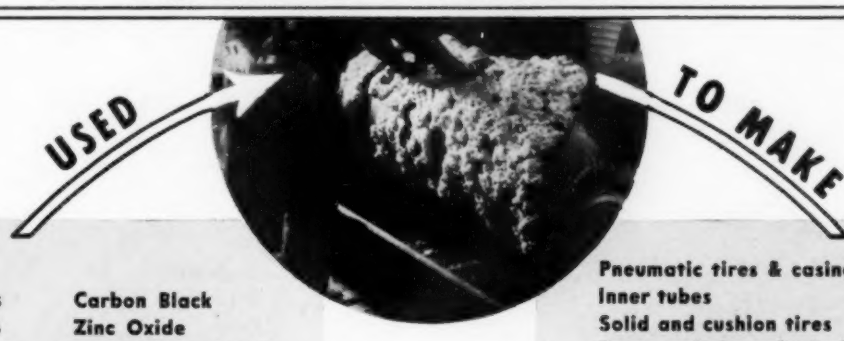
It is significant that in the textile industry the introduction of most of these new chemicals is not at the expense of older products. Rather they find entirely new applications resulting in novel improvements in quality and performance which were formerly believed impossible.

PRODUCTION, IMPORTS, EXPORTS AND APPARENT CONSUMPTION OF DYESTUFFS IN THE UNITED STATES 1914 - 1935

(Data from The United States Tariff Commission)



RUBBER INDUSTRY



106,850 Tons	Carbon Black
57,734 Tons	Zinc Oxide
36 Tons	Leaded Zinc Oxide
19,440 Tons	Lithopone
3,171 Tons	Litharge
8,600,000 Lb.	Accelerators
7,800,000 Lb.	Antioxidants
467,000 Long Tons	Crude Rubber
76,219 Long Tons	Reclaimed Rubber
33,000 Long Tons	Sulphur
11,000 Long Tons	Caustic Soda

Sources: U. S. Bureau of Census plus Chem. & Met. estimates for 1935, U. S. Tariff Commission

Pneumatic tires & casings	51,103,480
Inner tubes	49,310,810
Solid and cushion tires	7,147,436
Boots and shoes (pairs)	64,793,721
Heels and soles (pairs)	348,024,765
Rubberized fabric (sq.yd.)	70,706,658
Mech. Goods (lb.)	48,231,120
Hose (lb.)	93,568,192
Tubing, Packing, Washers Friction Tape	42,072,030
Erasers, bands, thread (lb.)	10,231,000
Flooring (sq.ft.)	5,905,877
Thread (lb.)	5,415,381
Jar rings (gross)	7,571,331

Source: U. S. Bureau of Census, 1935

PROSPERITY is returning to the rubber industry in a big way. While much of the increased business is due to the marvelous growth in the automobile industry with its enormous consumption of pneumatic tires and casings, and inner tubes, practically every branch of the rubber industry has shared in the recovery. The total value of all products increased from $472,743,000 in 1933 to $677,437,000 in 1935 and while the amount for 1936 is not available it is known to be much larger than that for the previous year.

This growth in the dollar value of the products of the rubber industry has only been accomplished by the consumption of a corresponding increase in the volume of raw materials, crude and reclaimed rubber, carbon black, zinc oxide, sulphur, antioxidants, accelerators, and a long list of many other so-called rubber chemicals.

While it is true that there has been an increase in consumption of every chemical the rate of growth has not been uniform. This is due to the changes that are constantly occurring in the formulation of the various compounds. We have witnessed a recovery in the price of raw rubber due to the control of production, which has made it economical to substitute considerable quantities of reclaimed rubber. If the price of crude rubber continues upward we are certain to see an even greater use of reclaimed. And of course the more rubber reclaimed the larger the volume of caustic soda required for the recovery.

Prior to a few years ago the rubber compounder used between 4 and 5 per cent of sulphur, while he now specifies much less, for example, in the case of tire compounds about 2.75 per cent. As the volume of sulphur has gone down there has been an increase in the use of accelerators in order to keep the vulcanization period constant. The consumption of these interesting groups of chemicals appears to have reached a maximum in the formulas and further increase in demand will depend on a further increase in the volume of rubber goods produced. Two other aids in vulcanization are being made use of in formulation. Selenium and tellurium serve to retard devulcanization and improve the product. The latter is still increasing in demand.

Antioxidants are being used in almost every type of compound in which they can be of advantage, which include insulated wire, high grade mechanical goods, rubber soles, tires and the like. About the only exception is rubber footwear. The amount has been slowly increasing in tire treads from about 1-1½ per cent five or six years ago to between 1 and 2 per cent at this time. However, the amount has about reached a peak unless higher performance requirements are demanded by the public, which is not likely.

Carbon blacks are on the increase, particularly the soft grades. These are in demand for mechanical goods, footwear, and the like. The trend in the consumption of zinc oxide varies with the price, while another white pigment, lithopone, is on the increase in rubber covered wire and miscellaneous goods. As for organic colors, it may be said that they are replacing the inorganic colors in specialty products, bathing suits and caps, raincoats, gloves, etc.

The plasticizing agents have attracted considerable attention among rubber engineers because of their aid in working the compounds. They make such operations as milling and calendering at elevated temperatures much easier. These plasticizers also contribute to lowering costs as they tend to decrease the power consumption. The products are not sticky and soft as a result of their addition.

Retarders are still employed to some extent with high speed accelerators such as organic acids and metal salts of organic acids. While the deodorants, various essential oils, are added to some products, their use has been somewhat disappointing for while they accomplish the duty of removing or covering the unpleasant odors common to rubber products the public has not shown proper appreciation.

MANUFACTURED GAS INDUSTRY

USED

TO MAKE

126,000 Tons	Anthracite Coal
7,849,000 Tons	Bituminous Coal
743,000 Tons	Coke (purchased)
510,608,000 Gal.	Oil
(50 Deg.) 70,000 Tons	Sulphuric Acid
7,000 Tons	Lime
	Gas (Purchased)
91,020,000 M.Cu.Ft.	Coke-Oven Gas
2,727,000 M.Cu.Ft.	Oil Ref. Gas
139,502,000 M.Cu.Ft.	Natural Gas

Source: American Gas Association, 1935 Chem. & Met. estimates

Water Gas	156,559,000 M.Cu.Ft.
Coke-Oven Gas	52,681,000 M.Cu.Ft.
Retort Coal Gas	26,827,000 M.Cu.Ft.
Oil Gas	3,589,000 M.Cu.Ft.
Reformed Oil Refinery Gas	4,923,000 M.Cu.Ft.
Reformed Natural Gas	2,816,000 M.Cu.Ft.
Butane-Air Gas	936,000 M.Cu.Ft.
Total Gas Produced	248,331,000 M.Cu.Ft.
Total gas made and purchased	387,833,000 M.Cu.Ft.

Source: American Gas Association, 1935

MANUFACTURED GAS sales in 1936 exceeded those of the preceding year by approximately 6 per cent, despite the fact that household use was a little less. House heating, industrial, and commercial activities demanding from 15 to 20 per cent more than in the preceding year, accounted for the improved total. The breakdown of the manufactured gas send-out, according to type of gas used, is clear from Fig. 1. One of the most notable features of this breakdown is the marked increase in the use of gas as a raw material, either for direct mixing or "reforming" as a constituent of the send-out. The trend in this direction was even more marked in 1936.

Sales of natural gas by utility companies, unmixed with manufactured, increased during 1936 to an all-time high in February, which made the amazing record of total natural gas sales of 136 billion cubic feet through utility systems. This send-out beat the previous February record by 30 per cent. The annual average, based on estimates for the first ten months, will be approximately 18 per cent greater than the preceding year. Household users took about 9 per cent more, commercial enterprises 13 per cent more, and industrial users 23 per cent more, than in the previous year. These trends are shown graphically in Fig. 2.

In considering the data of American Gas Association in comparison with those of the Federal Government, it should be noted that the definitions used by A.G.A. are not the same as those of either the Bureau of the Census or U. S. Bureau of Mines. To be sure that the unwary user of the data is properly confused, even the two bureaus do not use their definitions alike. Hence it is important in comparisons between the gas and the coke industry to recognize that these two interlocking, overlapping technical activities are not similarly reported by the three important agencies referred to.

Fig. 1. Manufactured Gas Send-Out by Types

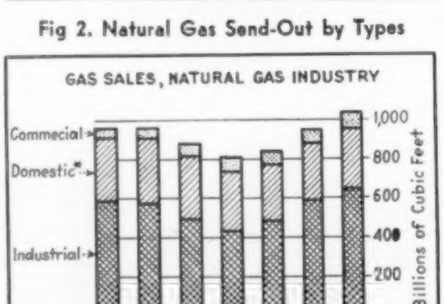
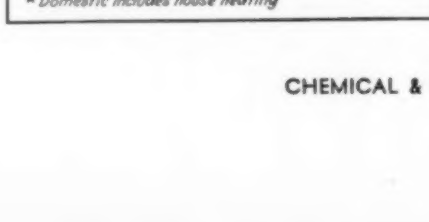


Fig 2. Natural Gas Send-Out by Types



Construction of new coal-carbonizing equipment was undertaken during 1936 by several concerns either to replace present antiquated plants or to enlarge plant capacity. This renewed activity indicates a restored optimism, the lack of which had practically interrupted all oven construction work during the previous five depression years. Most of the new construction is, however, not radically different from that of the latest predepression types.

During 1936 there also appeared several new forms of water-gas and producer-gas machines. Experimental operation of these indicates some marked improvement in fuel efficiency. Addition of control devices for more accurate functioning remains, however, the major benefit yet notable in the recent gas-making devices.

Refining of tar and the manufacture of larger quantities of higher-purity organic intermediates was a notable chemical development of 1936. Shrinkage of imports naturally stimulated this activity and increasing quantities of creosotes and other tar acids were a logical result. Oven operators also embarked further on manufacturing of pure benzol, toluol and related chemicals. Recovery of byproduct sulphur and of various cyanides and sulphocyanates increased during the year. Thus the industry demonstrates an important trend to become a factor in chemicals manufacture.

BYPRODUCT COKE INDUSTRY

USED

49,000,000 Tons	Bituminous Coal Carbonized
577,000 Tons	Sulphuric Acid (50. Deg. Bé.)
50,000 Tons	Lime

U. S. Bureau of Mines, 1935, and Chem. & Met. estimates

TO MAKE

Coke	34,000,000 Tons
Coke-Oven Gas	543,000,000 M.Cu.Ft.
Coke-Oven Tar	450,000,000 Gal.
Ammonium Sulphate	462,000 Tons
Ammonia Liquor (NH_3 contained)	21,000 Tons
Crude Light Oil	134,000,000 Gal.
Naphthalene	13,000,000 Lb.

U. S. Bureau of Mines, 1935

FUEL INDUSTRIES are today more interdependent than ever before. Thus the keen inter-fuel competition is cushioned by a certain amount of economic cooperation. And this competition is also made less severe in its technologic implications by the fact that constantly growing percentages of the national fuel supply come from processed fuel, rather than from raw coal.

Every division of fuel processing benefited materially in 1936 by improved business conditions. Even the economic orphan, the beehive coke industry, took on renewed life with about double the coke output in 1936 as during the preceding year.

Byproduct ovens produced about 44.5 million short tons of coke in 1936, an output 30 per cent greater than the preceding year. Consumption and sales were even higher relatively, as stocks of coke on hand at producers' plants at the end of 1936 were only 60 per cent of the stocks a year ago, amounting to approximately 1.8 million tons.

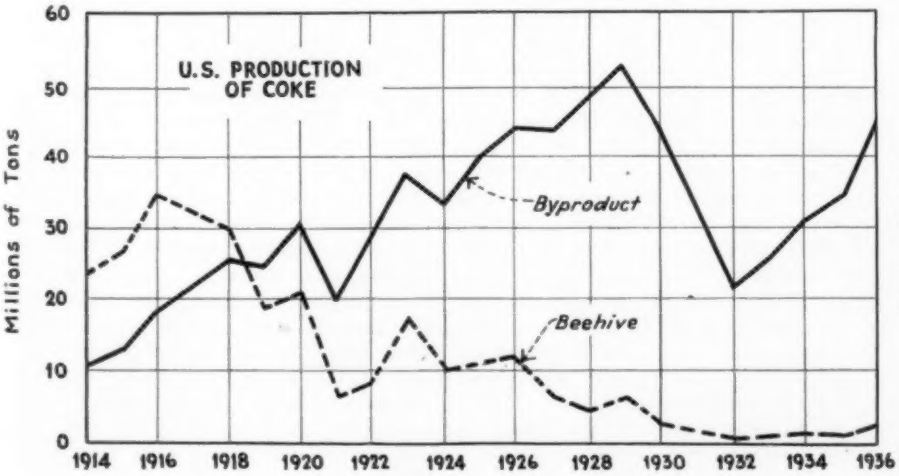
The output of coal products at byproduct ovens in 1936 was proportionately as much greater than 1934 as was the production of coke. The following byproduct production figures show official reports for 1934, 1935 and *Chem. & Met.* estimates for 1936:

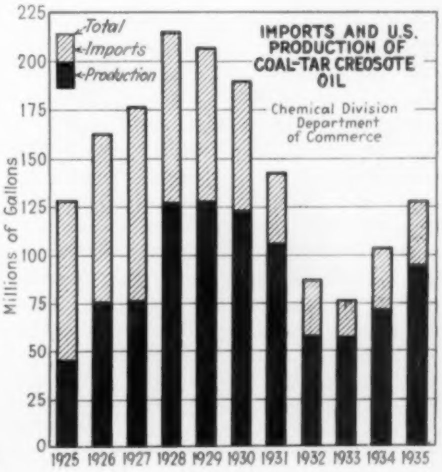
	1934	1935	1936
Tar, million gal.	409	450	580
Ammonium sulphate, thousand tons equivalent	480	545	700
Gas, billion cu.ft.	494	543	700
Light Oil, million gal. crude	116	134	175
Naphthalene, million lb. crude and refined	10.7	13	17

As would be expected, the increase in activity of byproduct plants was relatively greater in percentage at works affiliated with blast furnaces. Such establishments in 1935 operated on the average of less than half their total rated capacity; but during 1936 operated at nearly 70 per cent of capacity rating. Merchant plants, in contrast, operated at 72 per cent of capacity in 1935 and 81 per cent in 1936.

At the end of the year demand for metallurgical coke, as well as miscellaneous and household demands, gave promise of continued aggressive operation in both divisions of the byproduct industry during 1937. Unless the scope of automotive labor difficulties proves greater than even the more pessimistic of Washington forecasts, 1937 promises to be a more active year for the byproduct coke industry than any in its previous history.

U. S. Bureau of Mines. 1936, Chem. & Met. estimate





SUGAR REFINING INDUSTRY

USED

TO MAKE

CANE SUGAR REFINING

4,398,345 Tons	Raw Sugar
19,400 Tons	Lime
10,500 Tons	Kieselguhr
100 Tons	Bone Char

BEET SUGAR

7,500,000 Tons	Beets
408,000 Tons	Limestone
6,000 Tons	Sulphur

U. S. Census, 1935, and estimates
Corrections: 4,500 tons kieselguhr; 12,600 tons char

CANE SUGAR REFINING

Hard Sugar	3,914,804 Tons
Soft Sugar	295,162 Tons
Edible Syrups	2,886,558 Gal.
Non-Edible Syrups	22,305,646 Gal.

BEET SUGAR

Sugar	1,186,448 Tons
Molasses	233,536 Tons
Molasses Discarded	71,050 Tons
Pulp, All Types	1,546,003 Tons

U. S. Census, 1935

CANE SUGAR refineries enjoyed a reasonably good year in 1936, while the output of beet sugar factories was larger than at any time in the past decade, with the exception of 1932 and 1933 which were years of particularly heavy production. Taking annual receipts of raw sugar at refineries as indices (modified by the changes in refinery stocks during each of the years) the refining rates since the peak year of 1929 have been determined and are presented in the accompanying tabulation. Except for an apparent lag of about a year, the trend of sugar consumption has evidently followed the business cycle closely.

Detailed production figures on both the cane sugar refined and the beet sugar produced during 1935 appear in the tabulation at the top of the page, together with estimates of the quantities of raw materials consumed. Both the quantities of finished products and the raw sugar refined are as given in the preliminary tabulation of the 1935 U. S. Census of Manufactures. The quantities of raw materials are based on factors which have been carefully checked. It is to be noted, however, that the weight of lime given is considerably more than would be accounted for by the sort of operation practiced in certain refineries. The figure, which is estimated from data published by the Bureau of Mines showing actual lime shipments to sugar refineries in 1934 and earlier years, is believed to be close to correct. Nevertheless, the use of lime in sugar refining appears to be decreasing owing to changes in methods of refining. There was, for example, a sharp drop in 1919. And today, use of the blow-up is being dispensed with in a few refineries, further reducing the requirements. Even in these refineries, lime is used in small quantities, however, to avoid excessive inversion.

Indices of Sugar Refining Trends Since 1929

Year	Refining Rates,* Raw Sugar	Wholesale Prices, Granulated Sugar
1929	100	100
1930	95	92
1931	86	86
1932	84	78
1933	80	84
1934	70	86
1935	90	96
1936	83	87

* Based on raw sugar receipts at refineries, corrected for changes in stocks at refineries.

Aside from this, there appear to be no notable trends in refining practice likely to affect raw materials. Much more important are new technical developments that make for more economical operation. Positive circulation devices applied to sugar pans have improved the control of pan boiling and made it possible to keep a graphical record of the progress of crystallization, through continuous measurement of the power taken by the circulator. The development of the hot mingler and the high-speed geared centrifugal have introduced important advances and economies, as was described in detail in our January, 1937, number.

The hot mingler comprises a tank containing a rotating spiral mixing coil through which hot water circulates. It is employed to heat and mix raw sugar with the smallest amount of wash syrup that will produce a magma of the desired low viscosity and good centrifuging qualities; or to maintain the high temperature and low viscosity of a massecuite prior to centrifuging. The new gear-driven centrifugal, the usefulness of which depends largely on the availability of the hot mingler, operates at 1,500 r.p.m., rather than the 1,100 or 1,200 r.p.m. of the older machines, and accelerates at a much higher rate, giving a tremendous separating force. The consequence of the combined use of these two developments is more complete purging with less production of green syrup owing to the requirement of less wash water. There is less melting of the raw sugar, and in the case of white sugar, less frosting and melting of the crystal faces, thus producing a better looking product. In all, the improvements noted, particularly the reduction in by-processing and in the quantity of liquids in process, have made this development one of the most important in years in the sugar industry.

In addition to the definite success that has been scored in the improvements described, the industry is approaching a better understanding of the mechanism of crystallization and is actively pursuing means for effecting higher efficiencies in char processing.

VEGETABLE OILS INDUSTRY

USED

3,844,254 Tons	Cottonseed
23,861 Tons	Hulled Peanuts
53,278 Tons	Peanuts in the Hull
199,577 Tons	Copra
202,920 Tons	Corn Germs
731,910 Tons	Flaxseed
51,439 Tons	Castor Beans
369,239 Tons	Soybeans
69,083 Tons	Sesame Seed
10,000 Tons	Caustic Soda
21,496 Tons	Fullers Earth
14,000 Tons	Sulphuric Acid (50 deg.)

TO MAKE

Cottonseed Oil	1,184,038,860 Lb,
Peanut Oil	44,673,069 Lb.
Coconut Oil	252,841,492 Lb.
Corn Oil	99,787,789 Lb.
Linseed Oil	502,043,424 Lb.
Castor Oil	46,627,313 Lb.
Soybean Oil	105,056,204 Lb.
Sesame Oil	64,977,447 Lb.

Bureau of the Census, 1935

IMPROVEMENT in the industries which are large consumers of vegetable oils and animal fats brought about a larger tonnage movement of those commodities last year. Because of the high prices which were reached and the limited offerings of some selections at intervals there was considerable shifting in the soap trade from oils to fats and in other lines from one oil to another where interchangeability was possible. Among the newer oils which offered competition to China wood oil was oiticica oil which was imported from South America and which found considerable favor as the quality of the 1936 production was found to be higher than that imported in the preceding year.

Perilla oil also was imported in a larger way in order to satisfy the increased consuming demand. To meet this demand which they appear to have foreseen, Manchurian farmers have rapidly increased the acreage sown to perilla, until now it is one of the major crops of that country. Estimates say that about half a million acres were sown to perilla this last Spring, and the probable yield is placed at from 135,000 to 165,000 metric tons, or even 180,000 tons. These estimates however proved overly optimistic and the crop is now placed at about 133,000 metric tons. The decrease of 47,000 tons is declared to be due to the faulty methods of estimating the crop in Manchuria. Efforts are being made to have both governmental and private interests in this country attempt cultivation of the perilla seed, and experimental plantings have been made in some 20 districts, some of them in connection with the tung trees in some of the Gulf states.

Despite widely fluctuating prices, disturbed conditions in producing districts, and droughty conditions which at times threatened river transportation, China's tung oil exports through the port of Hankow, which handles approximately 90 per cent of the world's supply of this material, established a record last year according to reports received at Washington. Transshipments of South China oil through the British port of Hong Kong, however, declined somewhat.

A total of 79,449 short tons of tung oil was exported through the port of Hankow to world markets during 1936, of which 65,467 tons, or 82½ per cent of the total, went to the United States. During 1935 shipments through Hankow aggregated 69,572 short tons, of which 59,005 tons, or about 85 per cent, was consigned to the United States. The balance during both years was forwarded to Europe—chiefly Germany, England, and France. Shipments in that direction during 1936 aggregating 13,982 tons were 30 per cent greater in volume than in the preceding year, statistics show.

At least a part of this increase was due, it is believed, to speculative commitments, as during 1935, European holders were able to realize good profits by transferring stocks to the American market, particularly during the latter part of the year, it was stated.

While details regarding transshipments of South China tung oil through Hong Kong have not yet been received, available information indicates that the quantity going out of that port in 1936 was less than in the preceding year. During the first 11 months of the year a total of 6,219,950 pounds of oil was shipped from Hong Kong to the United States and 2,932,200 pounds was forwarded to European countries. Smaller shipments were made to a number of other countries. This compares with a total of 9,775,550 pounds shipped directly to the United States, 3,889,225 pounds to Europe, and 2,205,500 pounds to other countries during the whole of 1935.

Hankow tung oil quotations averaged a little less than 14 cents (United States currency) per pound in 1936 but fluctuated widely during the year. Opening at 11½ cents in January the trend fluctuated upward until 16¾ cents was reached in June, following which prices declined, closing at a little less than 11 cents at the end of November, during which the new crop began reaching the Hankow market, then recovering to 11.80 cents at the close of the year.

While reliable estimates regarding the new Chinese crop are not available, Hankow dealers estimate it to be of average size. Arrivals of new crop oil in Hankow from up-river points

during November and December were reported as normal but some concern was being evidenced regarding banditry in producing regions and the lack of rainfall which threatened river transportation, it was stated.

Until recently the United States has been entirely dependent upon China for its tung oil requirements, and with its large paint and varnish industry, has normally taken from 80 to 90 per cent of the total amount that has been exported from that country. At present, however, a domestic tung oil industry is being developed in the states of Alabama, Florida, Georgia, Louisiana, Mississippi, and Texas, where some 75,000 acres are now planted to tung trees of various ages. Approximately 10,000,000 pounds of tung nuts, the equivalent of 2,000,000 pounds of oil, are expected to be gathered from trees scattered through these states during the 1936-37 season.

Small Flaxseed Crop

Crushers of flaxseed did not operate so actively in the final quarter of last year as they did in the comparable period of 1935. The amount of seed crushed in the 1936 quarter was 194,071 tons with a production of 131,829,085 pounds of linseed oil compared with a crush of 231,942 tons of seed and a production of 156,607,804 pounds of linseed oil for the final quarter of 1935. Stocks of linseed oil on Dec. 31, 1936, were reported at 79,817,307 pounds.

The crush of soybeans in the fourth quarter of last year was 203,030 tons with an oil production of 60,044,691 pounds. These figures compare with a crush of 156,268 tons and an oil output of 43,712,220 pounds in the last quarter of 1935.

Tung oil tree plantings in six southern states have jumped in the last six years from 351,000 to 3,632,000, according to figures made public by the Bureau of the Census. This increase, it is pointed out, indicates the tremendous interest felt in the possibilities of this new crop. Mississippi leads the procession with more than 2,068,000 trees, and Florida follows next, with 1,064,000. Georgia is third with 215,898 and Louisiana comes hard on her heels with 213,000. Texas trails with only 6,470 trees.

Linseed oil showed but little net change in price from the beginning to the close of the year. As has been the case for some years, the domestic supply of flaxseed proved to be very small —approximately 6,000,000 bushels— and it was found necessary to depend upon the Argentine markets to make up the deficiency. This condition appears to be permanent and, in consequence the prices paid for Argentine seed largely determine the values for oil in domestic markets. The present Argentine seed crop is variously estimated with the probability that the exportable surplus will approximate 60,000,000 bushels. As the use of linseed oil in the manufacture of paints in Germany has been restricted, buying in the Argentine for German account should be lessened accordingly this year and thus somewhat relieve competitive bidding.

Growing demand for linseed cake and meal in domestic markets has made crushers less dependent on foreign buying which lends greater stability to prices for [illegible]

Coconut oil has been featured by sharp price fluctuations with the market for both copra and oil largely nominal in the latter part of the year because of conditions on the West Coast where the shipping strike prevented deliveries of these products.

Babassu oil was favored by the fact that it was not included in the list of oils which were made subject to import duties and its use was considerably expanded. Quantities of babassu nuts also were imported and converted into oil in this country. During the first nine months of last year, domestic production of babassu oil was reported at 27,739,787 pounds with consumption in the same period running to 29,881,697 pounds. The fact that this oil was given free entry—and this includes importations of nuts—caused considerable dissatisfaction in oil circles but the arrangement was ratified in the tariff agreement with Brazil and apparently the agreement will not be modified.

Production of Linseed Cake and Meal

	1935
Linseed Oil, Cake, and Meal industry all products, total value	$60,264,331
Oil, cake, and meal	$56,659,356
Other products	$3,604,975
Linseed oil, cake, and meal:	
Oil:	
Pounds	483,025,310
Value	$43,271,858
Cake and meal:	
Tons	470,760
Value	$13,387,498

Cottonseed Products, by Kind, Quality, and Value

From reports compiled from data collected in Monthly Inquiry on Cottonseed and Cottonseed Products.)

	Season (12 months) ended July 31 1935	1933	1929
Crude cottonseed products, total value	$177,738,000	$87,313,000	$265,247,000
Oil:			
Pounds	1,108,582,294	1,445,681,407	1,604,131,038
Value	$91,849,000	$47,234,000	$133,906,000
Cake and meal:			
Tons	1,614,345	2,093,168	2,281,576
Value	$54,023,000	$29,467,000	$90,706,000
Hulls:			
Tons	913,039	1,312,435	1,368,279
Value	$10,260,000	$4,681,000	$12,842,000
Linters:			
Bales	805,083	741,401	1,085,766
Value	$21,606,000	$5,931,000	$27,793,000
Cottonseed crushed, tons (2,000 pounds)	3,549,891	4,620,558	5,061,058

Factory Production, Consumption, and Stocks of Vegetable Oils

	Production 1936 Lb.	Production 1935 Lb.	Consumption 1936 Lb.	Consumption 1935 Lb.	Stocks 1936 Jan. 1 Lb.	Stocks 1936 Dec. 31 Lb.	Stocks 1935 Jan. 1 Lb.	Stocks 1935 Dec. 31 Lb.
Cottonseed, crude	1,244,616,982	1,184,038,860	1,246,055,768	1,182,334,379	132,842,908	143,385,529	97,469,323	132,842,908
Cottonseed, refined	1,159,027,720	1,089,863,004	1,169,985,324	1,241,267,484	402,203,361	427,767,606	513,105,520	402,203,361
Peanut, crude	69,822,493	44,673,069	106,599,150	109,046,320	17,521,947	12,103,948	13,358,063	17,521,947
Peanut, refined	100,057,173	100,790,717	94,893,637	101,122,181	12,031,210	16,084,750	12,973,968	12,031,210
Coconut, crude	258,088,504	252,841,492	590,484,197	542,041,069	127,931,102	59,551,067	152,761,421	127,931,102
Coconut, refined	340,469,323	363,863,299	358,822,533	403,920,335	23,992,468	15,457,567	34,277,479	23,992,468
Corn, crude	121,994,058	99,787,789	157,427,675	135,761,118	12,941,874	11,635,556	15,904,405	12,941,874
Corn, refined	138,124,809	118,455,194	42,973,471	38,814,678	7,682,391	12,875,656	11,241,268	7,682,391
Soybean, crude	225,297,183	105,056,204	202,524,285	100,882,342	20,329,276	20,303,343	14,311,712	20,329,276
Soybean, refined	180,722,187	78,100,996	162,105,421	68,384,511	10,115,051	12,301,564	4,413,543	10,115,051
Olive, edible	3,331,720	664,226	3,329,958	2,431,757	2,986,161	4,099,321	1,811,830	2,986,161
Olive, inedible	...	7,725	10,422,695	10,702,680	2,526,910	2,483,364	1,625,262	2,526,910
Sulphur oil	...	...	24,374,274	31,859,822	18,094,790	7,023,651	15,802,252	18,094,790
Palm-kernel, crude	...	...	64,808,764	58,909,726	28,403,737	12,530,802	2,847,905	28,403,737
Palm-kernel, refined	37,471,771	20,763,640	31,748,898	18,979,070	1,726,857	1,720,917	1,407,556	1,726,857
Rapeseed	...	...	52,335,777	35,801,697	12,232,924	14,210,486	12,884,339	12,232,924
Linseed	455,252,646	502,043,424	307,522,178	291,683,903	146,525,727	117,267,639	113,525,727	146,525,727
China wood	...	...	108,454,298	114,286,682	19,008,265	28,872,045	31,494,587	19,008,265
Perilla	...	...	80,830,309	41,809,395	12,873,195	19,752,392	3,771,767	12,873,195
Castor	84,553,321	46,627,313	31,736,912	25,762,198	7,983,374	12,134,164	12,277,106	7,983,374
Palm	...	...	283,554,508	251,292,538	69,527,681	92,030,197	76,969,170	69,527,681
Sesame	65,537,230	64,977,447	55,653,729	54,251,526	11,321,856	11,572,852	2,656,226	11,321,856
Babassu	27,739,787	...	34,674,749	...	...	1,912,625	...	...
Hempseed	12,656,415	...	11,510,960	...	...	2,013,197	...	...
All other	19,263,015	46,935,631	30,722,061	29,680,369	11,833,362	3,010,391	5,516,927	11,833,362

SOAP INDUSTRY

USED

412,260,000 Lb.	Vegetable Oils
28,566,000 Lb.	Animal Oils
109,970,000 Lb.	Fish Oils
762,858,000 Lb.	Animal Fats
96,000 Tons	Caustic Soda
170,000 Tons	Soda Ash
155,000 Tons	Silicate of Soda
58,000 Tons	Pumice and Pumicite
285,000 Bbl.	Rosin
13,000 Tons	Lime
6,000 Tons	Sulphuric Acid (50 deg.)
8,000 Tons	Muriatic Acid (20 deg.)
100,000 Tons	Salt
185,000 Gal.	Ethyl Alcohol
8,000 Tons	Caustic Potash

Census data, 1935 and estimates

TO MAKE

Toilet Soap	362,901,569 Lb.
Laundry Soap	1,933,651,701 Lb.
Granulated, Powdered, and Spray Soaps	502,122,591 Lb.
Soap Chips and Flakes	458,934,768 Lb.
Cleaners and Powders	427,333,657 Lb.
Hand Pastes	13,579,676 Lb.
Textile Soap	67,521,396 Lb.
Potash Soap, other than Textile or Liquid	20,523,776 Lb.
Liquid Soap	18,817,893 Lb.
Crude Glycerine (80%)	141,184,825 Lb.
Other Soap Products Value $11,057,814	

SOAP manufacturers operated at a higher rate last year with some let-up in activities in the second quarter of the year. Prices for raw materials were relatively high and the market for oils went through considerable price fluctuations with the lowest levels reached in April and May. Toward the close of the year all vegetable oils were soaring in price and soap makers were showing more interest in animal fats although the latter also were tending upward on the price scale. Tallow, however, remained relatively the lowest-priced soap-making fat and in consequence was meeting with a good buying demand.

Export shipments of soap increased with a total of 38,196,848 pounds consigned to foreign countries in the first 11 months of the year as compared with 35,582,756 pounds shipped during the calendar year of 1935.

Production of glycerine last year was on an enlarged scale with the home output reaching a total of 154,009,598 pounds of 80 per cent crude material. This compares with 141,184,825 pounds produced in 1935 and reference to preceding years, places the 1936 production at record levels. Supplies, however, have been limited throughout the year and it is evident that the growth in domestic production has been less than the growth in domestic consumption. The failure of foreign countries to produce the usual exportable surplus of glycerine has been an important factor in holding stocks at low levels. The status of our import trade may be seen by comparing inward shipments in prewar years with those for last year. For the fiscal year ended June 30, 1914, imports of crude glycerine into this country were reported by the Department of Commerce at 36,230,000 pounds with additional receipts of 551,000 pounds of refined glycerine. For the first eleven months of last year imports were reported at 9,945,755 pounds of crude and 2,491, 546 pounds of refined, which at least in part accounts for the scarcity of stocks in domestic markets.

Census Data for Soap Industry

	Pounds	Value
Soap, aggregate value:		
1935	....	$220,097,009
1931	....	238,062,122
1929	....	286,756,875
Bar soap:		
Toilet soap:		
1935	362,901,569	53,008,916
1931	305,638,280	53,064,155
1929	324,383,543	59,982,997
Laundry soap:		
White:		
1935	420,519,270	19,937,259
1931	787,731,756	33,282,684
1929	914,588,831	51,175,255
Yellow:		
1935	713,132,431	31,382,849
1931	643,372,418	35,102,433
1929	550,593,948	40,774,488
Granulated, powdered, and sprayed soap:		
1935	502,122,591	45,206,462
1931	421,803,780	40,976,787
1929	337,291,356	35,724,861
Bar cleansers containing soap:		
1935	7,003,152	424,372
Soap chips and flakes:		
Packaged, 1935	307,274,876	25,615,958
Bulk, 1935	151,659,892	10,713,357
Washing powders:		
Packaged, 1935	132,681,612	5,535,464
Bulk, 1935	81,881,760	2,115,862
Cleansers and scouring powders containing soap:		
Packaged, 1935	186,494,781	5,844,925
Bulk, 1935	19,272,352	617,562
Shaving soap, total value, 1935	....	9,210,700
Stick, powder, and cake, 1935	(1)	2,273,911
Cream (soap base), total value, 1935	....	6,936,789
Quantity reported, 1935	5,529,460	4,736,635
Quantity not reported, 1935	....	2,200,154
Hand pastes or mechanics' pastes, 1935	13,579,676	735,547
Textile soap, including potash and foots soap for textile manufacture, 1935	67,521,396	5,176,564
Potash soap, other than textile and liquid, 1935	20,523,776	1,466,490
Liquid soap, not including packaged shampoos, 1935	18,817,893	1,157,608
Soap stock or soap base, made for sale:		
1935	3,665,376	270,406
1931	8,977,784	546,682
1929	4,106,339	292,323
Soap not reported according to classifications above:		
1935	....	1,676,708
1931	....	[2] 75,089,381
1929	....	[2] 98,806,951

[1] No data.

[2] Includes values of products of the classes for which separate figures are given for 1935, but for which no comparable figures are available for earlier years.

ALCOHOL AND SOLVENTS

USED TO MAKE

187,849,299 Gal.	Molasses
65,922,466 Lb.	Corn
14,134,676 Lb.	Malt
3,837,630 Lb.	Rye
13,698,550 Gal.	Ethyl Sulphate
28,245,237 Lb.	Hydrol
5,316,620 Gal.	Pineapple Juice
1,190,183 Gal.	Fermented Liquor
1,850 Lb.	Miscellaneous

Ethyl Alcohol	180,645,920 Pf. Gal.
From Which Was Made:	
Denatured Alcohol C.D.	38,746,679 Wi. Gal.
Specially Denatured	58,284,395 Wi. Gal.
Specially Denatured Withdrawals:	
S.D. 1	15,803,575 Wi. Gal.
S.D. 2B	15,012,222 Wi.Gal.
S.D. 4	1,345,664 Wi. Gal.
S.D. 13A	1,046,476 Wi. Gal.
S.D. 18	7,434,192 Wi. Gal.
S.D. 23A	4,220,032 Wi. Gal.
S.D. 29	5,981,399 Wi. Gal.
S.D. 35A	1,342,951 Wi. Gal.
S.D. 40	1,749,862 Wi. Gal.
S.D. All Other	24,717,095 Wi. Gal.

Bureau of Internal Revenue, Report for 1935

JUDGED purely from a volume standpoint, the market for solvents last year was very satisfactory, the tonnage moved closely approximating that for 1929. A review of composite prices, however, offers conclusive evidence that the year was far from favorable from the viewpoint of profit. Taking the industry as a whole an all-time low record was established for prices.

Statistics for the calendar year indicate that production of ethyl alcohol was on an enlarged scale and sales likewise registered a gain over those for the preceding year. Competitive conditions were again prominent due partly to the attitude of producers and partly to the position of some of the other solvent products. On the other hand, production costs for ethyl alcohol were on a higher average basis because of the rise in grain values and because blackstrap molasses found a larger market as a cattle feed and prices stiffened accordingly.

Anti-Freeze Trade

Prices for alcohol for use in the anti-freeze trade were announced in August and were well maintained until November when the New York market was subjected to selling pressure with two new producers competing for business. Sales are reported to have been made at price levels which were below what is generally recognized as production cost. As a large part of sales were made on a basis of December 15 dating, very little of the anti-freeze alcohol was paid for at the original sales schedule. Total sales of ethyl alcohol for anti-freeze purposes were reported to have been below those of the preceding year although larger sales were reported for ethylene glycol, for methanol, and for methyl-isopropyl blend.

One of the developments of the year was found in the fact hat the output of synthetic alcohol was increasing. It is further reported that some producers who are now using molasses and grains as raw materials are considering the advisability of making use of synthetic processes.

In its report for the fiscal year ended June 30, 1936, the Bureau of Internal Revenue stated that production of ethyl alcohol amounted to 196,126,236 proof gallons, compared with 180,645,920 proof gallons produced in 1935, and 165,103,582 proof gallons produced in 1934. The 1936 production is only about 3 per cent less than the 202,616,750 proof gallons produced in the fiscal year 1929.

Withdrawals exceeded production by 3,812,564 proof gallons and amounted to 199,938,800 proof gallons, compared with 183,095,759 proof gallons in 1935, and 156,152,522 proof gallons in 1934. Withdrawals in 1936 actually exceeded the 1929 consumption, which amounted to 191,376,549 proof gallons. This is due to the withdrawal currently of large amounts of tax-paid alcohol for beverage purposes, a demand which did not exist in 1929.

Withdrawals of ethyl alcohol on payment of tax in the fiscal year 1936 amounted to 24,052,532 proof gallons, an increase of 7,061,560 proof gallons over the previous year, and represented 12.0 per cent of total withdrawals, compared with 9.3 per cent in 1935. The withdrawals for tax-free purposes in 1936 amounted to 175,886,268 proof gallons, an increase of 9,781,481 proof gallons over the preceding year. Small increases occurred in withdrawals for hospital and scientific use, for use of the United States and subdivisions, for export, and for medicinal and beverage purposes in Puerto Rico, but the increase in tax-free withdrawals was largely for the production of denatured alcohol.

Three new alcohol plants began operations during the fiscal year, one each in California, Puerto Rico, and New York, and two in New York resumed operations. In addition, two experimental plants began operations in

Delaware. Two plants which had operated in 1935 were discontinued and two others suspended operations in 1936. The largest producing states in 1936 were Pennsylvania, New Jersey, Louisiana, and Maryland, in the order named.

The amount of molasses used in the production of ethyl alcohol decreased from 187,849,299 gallons in 1935 to 173,385,873 gallons in 1936, while the consumption of corn and other grains increased from 83,894,772 pounds to 180,350,892 pounds. The relative production of alcohol from various materials follows: from molasses, 76.1 per cent; from ethyl sulphate, 16.1 per cent; from grain, 7.0 per cent; and from miscellaneous materials, 0.8 per cent. The production of alcohol from ethyl sulphate has increased both absolutely and relatively during the past two years. In 1935 production from ethyl sulphate amounted to 9.7 per cent of the total, and in 1934 it amounted to only 7.3 per cent of the total.

The production of denatured alcohol amounted to 101,477,843 wine gallons in the fiscal year 1936, compared with 97,031,074 wine gallons produced in 1935, and 82,241,403 wine gallons produced in 1934. Withdrawals in 1936 amounted to 100,519,677 wine gallons, compared with 96,703,993 wine gallons in 1935, and 83,177,894 wine gallons in 1934. Withdrawals in 1936 consisted of 64,819,485 wine gallons of specially denatured alcohol, and 35,700,192 wine gallons of completely denatured alcohol, the former representing an increase of 6,166,017 wine gallons, and the latter, a decrease of 2,350,333 wine gallons, compared with 1935. Specially denatured alcohol constituted 64.5 per cent of the total withdrawals of denatured alcohol in 1936, compared with 60.6 per cent in 1935, and 65.8 per cent in 1934.

Acetone

A material increase in production featured the market for acetone with the old companies stepping up operations and a new producer added to the supply. While consuming demand was broader, it did not equal the volume of offerings and the statistical position was unfavorable for maintaining anything like a stable price structure. Two producers hold some of the largest consumers under long term contracts and this adds to the competitive situation since other producers are forced to find a market for their product among the relatively smaller consumers. As a result, competition has been very keen for less than carlot business. In some cases price concessions were given to foreign buyers in order to dispose of stocks outside this country. Exports in 1935 amounted to 2,884,386 pounds valued at $296,291 while in the first eleven months of 1936 outbound shipments reached a total of 4,908,734 pounds valued at $404,051.

Methanol

The wood distillation branch of the chemical industry made considerable progress during the year. The output of crude methanol showed an appreciable gain over the total for 1935 and sales were reported to have been on a par with production. Owing to the strong statistical position of the industry in the latter part of the year, producers were able to advance the price for the denaturing grade.

Production of synthetic methanol is on a progressive scale with each year making a record for volume of output. Consuming outlets appear to be expanding in proportion to the rise in production as total output for last year is said to have found ready disposal. In fact, one producer was said to have run into an oversold condition and was forced to enter the open market and purchase stocks in order to fill existing contracts.

Higher Alcohols and Acetates

The industries which are large consumers of butyl alcohol and butyl acetate were more active during the last year and this condition has a favorable reaction on both production and distribution of these solvents. The trend toward use of finishes for the automotive industry, in which butyl alcohol and butyl acetate did not figure as a raw material, was checked partly because of the scarcity of glycerine and phthalic anhydride for the manufacture of resins and partly because one of the large motor car companies had difficulty in securing desired results with the newer finishes which may have deterred potential users from switching to the special resin lacquers.

Prices followed the downward trend which was common to the solvent market. Sales pressure was in evidence at all times and butyl alcohol sold at prices only slightly higher than the cost of alcohol plus acetic acid and butyl acetate sold at about the same level as ethyl acetate. After the passage of the Robinson-Patman Bill some of the larger producers leveled their entire price schedules to meet the prices quoted on special long term commitments.

In the case of higher alcohols and acetates, price developments had a depressing effect on production. Some producers preferred not to accept business at the low quotations and checked manufacturing operations accordingly. Therefore for a part of the year, sales outstripped production and when inventories had been depleted, customers found it difficult to obtain prompt delivery on new orders.

Ethyl acetate was distributed in large volume but was forced to low price levels by the competition among sellers and by the position of competing products.

Output of methyl ethyl ketone was increased and the same held true for sales. A good part of sales were for special uses in fields where competition from other solvents was not important and sales pressure, therefore, was less a factor. No advance in price was announced, however, for 1937 deliveries and the low price of acetone makes it improbable that any advance will be made before the latter part of this year when prices may advance so as to permit a higher 1938 contract level.

Production of Methanol

Year and Month	Production (Gallons) Crude [1]	Synthetic
1936		
January	494,081	1,418,863
February	494,144	1,540,171
March	476,496	1,631,832
April	426,313	1,692,921
May	427,079	1,754,998
June	413,930	1,863,405
July	374,110	1,950,825
August	447,499	2,309,377
September	429,500	2,695,591
October	511,541	3,278,052
November	520,722	3,417,755
December	548,982	2,009,952
Total	5,575,038	25,563,742
1935		
January	386,477	1,303,171
February	363,781	1,126,799
March	411,326	1,303,230
April	450,941	1,167,282
May	452,322	1,203,143
June	385,472	1,198,186
July	379,309	1,278,505
August	403,020	1,389,812
September	405,034	1,539,554
October	454,233	2,508,978
November	478,474	2,373,475
December	478,331	1,654,794
Total	5,048,720	18,046,929

Alcohol Produced at Industrial Plants and Withdrawals for Denaturing

Fiscal Year	Alcohol Produced Proof Gal.	Ethyl Alcohol Withdrawn for Denaturation, Proof Gal.	Denatured Alcohol Produced: Completely, Wine Gal.	Special Wine Gal.	Total, Wine Gal.
1922	79,906,101.50	59,549,919.6	16,193,523.60	17,152,224.31	33,345,747.91
1923	122,402,849.81	105,819,404.9	27,128,229.54	30,436,913.14	57,565,142.68
1924	135,897,725.83	121,576,196.1	34,602,003.72	33,085,292.04	67,687,295.76
1925	166,165,517.81	148,970,220.9	46,983,969.88	34,824,303.28	81,808,273.16
1926	202,271,670.32	191,670,107.2	65,881,442.43	39,494,443.80	105,375,886.23
1927	184,323,016.97	170,633,436.7	56,093,748.16	39,354,928.48	95,448,676.64
1928	169,149,904.83	159,689,378.2	46,966,601.28	45,451,424.28	92,418,025.56
1929	200,832,051.08	182,778,966.1	52,405,451.92	54,555,006.15	106,960,458.07
1930	191,859,342.42	181,601,420.3	58,141,740.88	47,645,796.84	105,787,537.72
1931	166,014,346.15	149,303,438.5	49,136,200.64	37,172,740.71	86,308,941.35
1932	146,950,812.76	132,578,234.7	34,298,235.54	44,031,281.80	78,329,517.34
1933	115,609,754.29	103,753,240.7	26,254,230.80	35,076,115.90	61,600,346.70
1934	165,103,582.00	137,416,765.0	27,174,311.00	55,067,092.00	82,241,403.00
1935	180,645,920.00	163,009,786.0	38,746,679.00	58,284,395.00	97,031,074.00
1936	196,126,236.00	199,938,800.0	36,522,358.00	64,955,485.00	101,477,843.00

RAYON INDUSTRY

USED → TO MAKE

73,850 Tons	Linters
111,250 Tons	Sulphite Pulp
160,000 Tons	Caustic Soda (76%)*
309,000 Tons	Sulphuric Acid (50°)
45,700 Tons	Carbon Bisulphide
9,000 Tons	Pigments
22,500 Tons	Glucose
18,000 Tons	Glacial Acetic Acid*
6,700 Tons	Acetone*
500 Tons	Ammonia (Anhydrous)
320 Tons	Copper Sulphate*
50,000 Tons	Sodium Sulphide, Zinc Salts, HCl, Bleaching Materials, Soaps, Oils, Glycerine, etc.

Chem. & Met. estimates
**Estimated consumption in excess of recovery*

Viscose and Cupra Rayon	202,010,000 lb.*
Acetate Rayon	55,547,000 lb.*
Viscose and Acetate Wrapping Film	60,000,000 lb.
Staple Rayon	5,200,000 lb.

Chem. & Met. and Textile Organon estimates
**Combined total as in U. S. Census, 1935*

LACK OF CAPACITY, not lack of demand, was the factor which gave the most worry to the rayon industry in the United States during 1936. It is no novelty to state that both production and consumption established new records, for with few exceptions, they have done so in each of the 25 years since the industry was started. But operation at the limit of capacity is something new in the recent history of the industry and this condition is expected to persist until the new units initiated and projected in 1936 become effective late this year, or in 1938. Meanwhile, so far as records are available, it appears that the heavier importations begun in August are continuing at a rate higher than at any time since the textile revival in 1933. And stocks are presumed to be no more numerous than they were at the turn of the year when only a three days' supply was visible.

As in past years, the central statistical agency of the rayon industry, *Rayon Organon*, has published the year's production and consumption figures, finding that total production advanced to 277,626,000 lb. of rayon filament yarns, an 8 per cent increase over the 257,557,000 lb. total of 1935. Whereas 1935 consumption of 252,676,000 lb. was slightly less than production, 1936 consumption of 297,594,000 lb. so far outstripped production as to demand the withdrawal of some 21,500,000 lb. from stocks. Of the total production, 214,926,000 lb. consisted of viscose and cuprammonium yarns (of which we believe about 9,500,000 lb. was cupra), and 62,700,000 lb. was acetate. The striking upward trend of acetate which began in 1931 has continued so that now it accounts for nearly 23 per cent of the total, compared with the 7 per cent which was acetate as recently as 1929.

Rayon Production and Imports, 1921-1936

	Thousands of Pounds		
	U. S.* Production	U. S.† Imports	World* Production
1921	18,000	3,276	65,000
1922	26,000	2,116	80,000
1923	35,000	3,029	97,000
1924	38,750	1,954	141,000
1925	52,200	5,441	185,000
1926	62,575	9,345	219,000
1927	75,050	15,028	267,000
1928	97,700	12,117	345,000
1929	121,399†	15,039	404,000
1930	127,333†	6,341	417,000
1931	150,879†	1,804	470,000
1932	134,670†	197	509,000
1933	213,498†	934	660,000
1934	208,496†	77	799,589
1935	257,557†	26	932,780
1936	277,626†	(est.) 175	1,050,000†

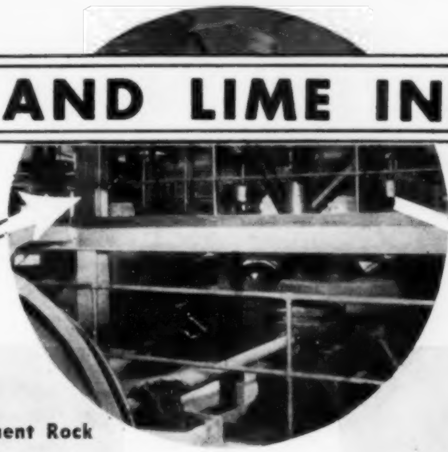
*From *Textile World* except as noted.
†From *Rayon Organon*. Does not include staple which is estimated at 350,000 lb. in 1930; 880,000 lb. in 1931; 1,100,000 lb. in 1932; 2,100,000 lb. in 1933; 2,200,000 lb. in 1934; 5,200,000 lb. in 1935; and 12,400,000 lb. in 1936. World staple estimated at 275,000,000 lb. in 1936. Imports to 1930 cover yarns, threads and filaments; since 1930 yarns, single and plied.

As in the case of our domestic production, that of nearly every producing country in the world increased in 1936. Well over a billion pounds—possibly 1,050,000,000 lb. according to the *Organon*—seems to have been the combined world total. Considering filament yarns alone, for the first time in many years the United States' leading position in production has been seriously challenged by another country. Japanese production, growing by leaps and bounds, has reached an estimated total close to 275,000,000 lb., and including staple fiber, 325,000,000,000 lb., which is considerably in excess of the combined United States total. Throughout the world, staple fiber has, in the last two or three years, suddenly reached a position of great prominence. Where the world's staple production in 1930 was not over 7,000,000 lb., according to the *Organon* it reached an estimated 134,000,000 lb. in 1935, and 275,000,000 lb. in 1936. Germany, Italy and Japan together—all intensely interested in economic self-sufficiency—accounted for probably 80 per cent of this production, while Great Britain produced about 10 per cent, and France and the United States, less than 5 per cent each.

Staple, therefore, is the big rayon news in many parts of the world. Textile men in this country differ in their opinions of its ultimate importance in the United States, but nevertheless, more than 25,000,000 lb. (including 13,000,000 lb. imports) appears to have been consumed domestically in 1936, thirteen times the consumption in 1929, and nearly four times that of 1935.

(Please turn to page 95)

CEMENT AND LIME INDUSTRIES



USED

TO MAKE

CEMENT

19,690,000 Tons	Limestone and Cement Rock
2,400,000 Tons	Clay and Shale
600,000 Tons	Blast Furnace Slag
660,000 Tons	Marl
460,000 Tons	Uncalcined Gypsum
700,000 Tons	Oyster Shells, etc.

LIME

4,600,000 Tons	Limestone

Chem. & Met. estimates and Bureau of Mines

CEMENT

Portland Cement	76,751,419 Bbl.

LIME

Quicklime	1,414,650 Tons
Hydrated Lime	837,876 Tons
Agricultural Lime	223,819 Tons

U. S. Census, 1935

ALTHOUGH building is still at a rate far below what appears to be necessary to make up the accumulated deficit in structures, 1936 in the portland cement industry was a marked improvement over 1935, reaching a production of approximately 111,815,000 bbl. as compared with the 77,757,483 bbl. produced in 1935. This 44 per cent increase brings the industry back near the level of 1922, which was until then the all-time peak year, not excluding the period of the World War. Such a level, however, was dwarfed during the boom of the late twenties, when a production peak as high as 176,298,846 bbl. was built up in 1928. If the industry were not geared to a capacity in the neighborhood of 260,000,000 bbl., prospects would be bright.

In the tabulation presented at the top of the page, we have attempted to correlate figures of known production with estimated quantities of the several types of raw materials that were used in portland cement manufacture in 1935. In general, there are four types of portland cement made in the United States. The great bulk of production is from limestone and clay or shale. A smaller, though still substantial, part employs cement rock (argillaceous limestone) with or without the admixture of pure limestone. About 10 per cent of total production is from blast furnace slag and limestone and a small quantity from marl and clay.

So far, in recent years, technical improvements in cement manufacture have overshadowed what trends may have become apparent in raw material requirements. Among these may be mentioned improved separation systems in conjunction with both wet and dry grinding, and the development of waste heat recovery equipment. Using both mechanical and electrostatic dust collectors, one plant has developed an efficient recovery of potash values from flue dust (*Chem. & Met.*, July, 1933, p. 345). But, for the future, the example of the Valley Forge Cement Co. in adapting flotation to the preparation of its raw material may work a great change in the industry's raw material sources. This process (*Chem. & Met.*, Feb., 1935, p. 68) has permitted the mill to perfect an unsuitable raw material and become independent of outside raw material supplies.

(Continued from page 94)

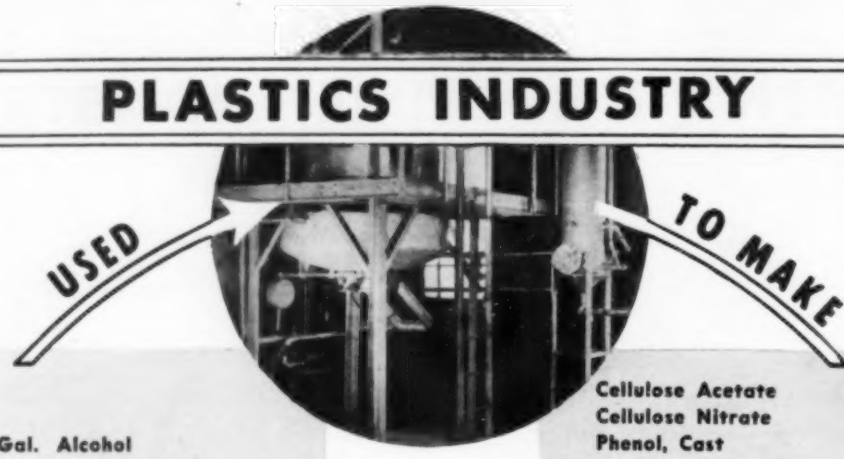
Although valued in the United States chiefly for the interesting novelty effects it gives in combination with other fibers, rather than as a substitute for wool, staple seems to have attained a permanent and important place.

Along technical lines, the search for higher production efficiency continued actively during the year, catalyzed by a relatively stable price structure which was only slightly higher than the average of the depression years. In some quarters the investigation of new compounds suitable for spinning into fibers increased in interest. The development of a suitable rayon pulp from Southern pine went actively ahead and the highly encouraging results attained with experimental batches led to the completion of plans for greatly enlarged experimental pulp production capacity.

A few words of comment in regard to our estimates of rayon and wrapping film raw materials during 1935 are desirable at this point. For the most part, the estimates are based on the best available factors, which attempt to average the results of the industry. The least certainty attaches to the figures for caustic soda, acetic acid and acetic anhydride, acetone, and copper sulphate, for each of these materials is recovered to a greater or lesser extent, and with various degrees of efficiency throughout the industry. The situation is particularly complex in respect to acetic acid and anhydride used in making acetate, for acetylation is accomplished with a mixture of these materials, the bulk of which is later recovered as dilute acetic acid. By one means or another, this must be reconverted to glacial acetic acid and acetic anhydride, and the efficiency of this recovery largely determines the success of the producer. In addition to losses, the figure for acetone includes 800 tons estimated as needed for new capacity.

The materials estimates, it should be noted, include also transparent wrapping films of cellulose and cellulose acetate. Where the production of these materials was estimated at 60,000,000 lb. in 1935, it is believed to have increased by some 13 per cent in 1936. Of this, some 60,000,000 lb. was probably cellulose film and 8,000,000 lb. acetate film.

PLASTICS INDUSTRY



5,500,000 Wine Gal.	Alcohol
2,101,000 Lb.	Urea
36,000,000 Lb.	Phenol
38,000,000 Lb.	Formaldehyde
5,300 Tons	Sulphuric Acid (100%)
9,600 Tons	Nitric Acid (100%)

Sources: U. S. Tariff Commission and Chem. & Met. estimates

Cellulose Acetate	10,731,771 lb.
Cellulose Nitrate	19,387,314 lb.
Phenol, Cast	5,566,621 lb.
Other	30,756,522 lb.
Phthalic Anhydride	34,312,713 lb.
Xylenols	245,506 lb.
Maleic Acid Sulphamides Styrols and Cresols	3,623,215 lb.
Urea	6,200,000 Lbs.
Total (without fillers)	108,805,198 lb.

Source: Chem. & Met. estimates

A GLANCE at the accompanying diagram is sufficient to show that the synthetic resin branch of the plastics industry is growing at an enormous rate and is headed for much greater heights, while an increase of more than 4,000,000 lb. in 1936 over 1935 demonstrates that the cellulose plastics are going ahead very rapidly.

Several cellulose plastics are now available, cellulose acetate, cellulose nitrate and ethyl cellulose. The acetate plastics may be divided into sheets, rods, and tubes for fabricating, and blanks and granular material for molding into shapes. In 1935 the sheets, rods and tubes produced amounted to 10,731,771 lb. and in 1936 to approximately 13,265,000 lb. The sheet material finds its greatest use in laminated safety glass. About 80 per cent of all safety glass being made and used in this country contains the acetate. In 1936 the sales of the blanks and granular material more than doubled the previous year's total, due primarily to the increased use of the injection molding process. The original domestic injection machine manufacturer has greatly improved his product and two other domestic manufacturers introduced machines of their own make during the latter part of the year. It is expected that machines capable of injecting much larger articles will be placed on the market in 1937, further increasing the field for this type of molding.

During the past year 26 makes of automobiles have employed cellulose acetate moldings in the interior appointments. One of the most important uses has been for steering-wheels, not only as an accessory item but as standard equipment on several cars. It is anticipated that this trend will be accelerated during 1937, especially as injection machines capable of forming wheels become available.

Continued increase in production and decrease in price of the raw material, cellulose acetate, makes the outlook for the acetate plastics even brighter. Cellulose acetate is now available to even the smallest consumer at 40 cents per lb.—about one-half its price in 1932. In large quantities the price is as low as 38 cents per lb. Operating economies brought about by increased production are responsible for the greater portion of the decrease in price, but some can be attributed to technical advances in the production of acetic anhydride and the recovery of glacial acetic acid used in the manufacturing process. Further reductions are anticipated as new processes for the production of anhydride and glacial acid are perfected and the use of wood pulp instead of cotton linters is established. Another manufacturer, Hercules Powder Co., has entered the field, increasing the competition for the available markets.

Although cellulose acetate is cutting into the nitrate industry, large amounts are still being consumed, the 1936 production (20,540,000 lb. of sheets, rods and tubes) showed a slight increase over the previous year. About one-quarter of all laminated safety glass contains the nitrate plastics.

Advances have been made in the quality of cellulose nitrate used for plastics. As a raw material, purified wood pulp is coming into competition with cotton linters. There is considerable interest in the nitration of the wood pulp in the form of compact thick sheeting, known as dense cellulose. Such material cut in the form of uniform tiny chips, is so much less voluminous than other forms of cellulose, such as linters, that several times as much can be nitrated in existing equipment, and a much smaller bulk of acid needs to be handled for a given production of nitrocellulose (A. F. Randolph, *Chem. & Met.* Vol. 44, page 25).

Ethyl and benzyl cellulose are imported by Advanced Solvents and Chemical Corp., and Hercules Powder Co. has constructed a plant for the production of the ethyl cellulose in this country. It is marketed as a white granular powder. In small quantities the price is $1.15 per lb. and in the case of a yearly consumption of 10,000 lb. the price is now 85c. per lb.

In the plastic field progress has been relatively slow, chiefly because of the high price of the material. However, since ethyl cellulose handles so excellently under heat, and since only small amounts of plasticizers are required (10-40 per cent on the cellulose ether), expansion in this field appears quite logical, according to J. M. DeBell (*Chem. & Met.*, Vol. 44, page 31). The plastic properties favor use as a

pigment grinding base, since all ordinary pigments including the recalcitrant yellows and blues can be incorporated in ethyl cellulose by heat on rolls or in masticators, with no fear of combustion or undesirable color effects. The resultant chips can be incorporated in nitrocellulose lacquer or oil varnish. Ethyl cellulose in safety glass shows excellent cold break characteristics.

Urea formaldehyde resins reached a total production last year of about 7,000,000 lb. (including fillers). The previous year about 6,200,000 lb. were produced by the three manufacturers. There has been an increase in the lighting fixtures market to a point where this is probably the most outstanding application for the urea resins. The large moldings, housings for scales and other equipment, is another important outlet for these resins. Perhaps the third largest demand comes from button manufacturers. Prices remained substantially constant throughout the year. The basic price was 35c. per lb. A few months ago the Unyte Corp. was absorbed by the Plaskon Co., Inc., thus leaving only one other producer, American Cyanamid & Chemical Co., of the urea plastics.

During the early part of 1936 the new Vinylite plant of the Carbide & Carbon Chemicals Corp. was completed. However, due to difficulties production has not reached the 4,000,000 lb. capacity. In the neighborhood of 2,000,000 lb. of the resin were produced. The increased production made it possible to lower the price to the consumer to about 50c. per lb.

The principal applications were for the lining of beer cans, denture, novelties, coating paper, and screw caps on food products. In April announcement was made of the use of this resin in safety glass (*Chem. & Met.*, Vol. 43, page 177). Vinylite X is used with plasticizers to make a plastic sheet known as Vinal for safety glass. It is being used at the present time at the rate of approximately 25,000 sq.ft. per month. It is therefore still in the pilot plant stage. Results have been highly satisfactory and it is expected that the production will be increased shortly to at least ten times present production.

The cast phenolic resins have moved upward steadily. There was about a 30 per cent improvement in sales in the past year when 5,800,000 lb. were sold. Prices declined slightly to an average of 43 or 44c. per lb. The Catalin Corp. of America remains the principal producer, but Joanite, Bakelite, du Pont, Marbelite and Fiberloid made some resin. Approximately 40 per cent of the cast resin goes into the production of buttons, but novelties, architectural purposes and adhesives for laminating board are other important outlets. About 8 per cent of the 1936 production was consumed in the laminating industry and indications are that an even larger percentage will be required for this market in 1937.

The molding phenolic resins produced last year amounted to about 52,000,000 lb. (including filler), the laminated material to about 17,000,000 lb. (including weight of paper), the varnish resin to approximately 5,500,000 or 6,000,000 lb., and the miscellaneous phenolic resin products to about 6,500,000 lb.

With the increased production and consumption of the varnish resins has come a decided tendency to reduce prices. The prices on some materials have come down slightly, but the prices on molding and laminating materials have hardened and may be expected to increase soon.

Several new plastics were announced during the year. The annual report of the U. S. Forest Products Service reports a recently developed plastic made by hydrolizing wood in the presence of aniline. It promises to be stronger and more water resistant than any of the currently used wood plastics. A new clear thermoplastic, hydrocarbon resin has been developed by the Neville Co. and has been introduced under the trade name of Nevillite. It is designed for maximum color retention. It is soluble in petroleum solvents, aromatic solvents, and is compatible with most natural and synthetic resins.

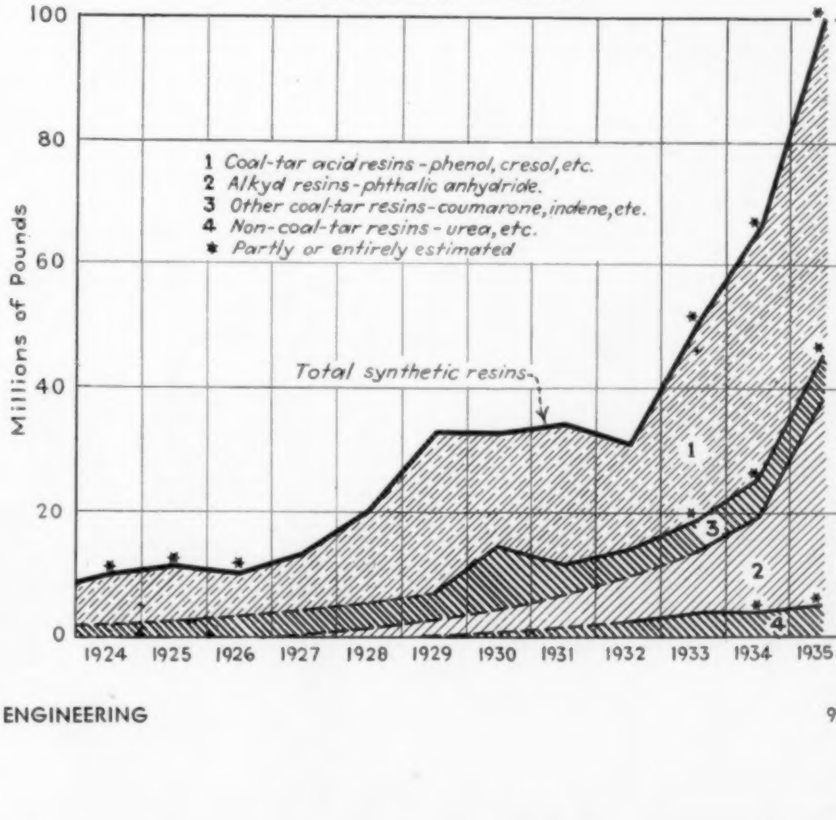
Early in the year the resins, polymers of the acrylic acid derivatives, known commercially as Acryloids, were announced by the Rohm & Haas Co. More recently a similar resin was offered by the E. I. du Pont de Nemours & Co. The new methyl methacrylate resin is known as Lucite. It is a polymerized derivative of methacrylic acid, and is sold as a cast resin in the form of sheets, rods and tubes, and as a thermoplastic molding powder. In both forms it will be available as a crystal clear product and in a wide variety of brilliant transparent, translucent and opaque colors. This resin can be injection molded by the usual injection molding technique. Cast and molded objects present approximately comparable solubilities. The presence of plasticizer in molded objects may either increase or decrease the solubility depending upon the solvent used.

Since the water absorption is extremely low, it is unaffected by water solutions of mineral salts or alkalis. It is resistant to concentrated hydrochloric acid and to 50 per cent sulphuric acid at room temperature. It is insoluble in straight chain hydrocarbons, alcohols, ethers, and in most fats, oils and waxes.

Probable applications include steering wheels, distributor heads and antenna stanchions for automobiles, combs, nuts and bolts, umbrella handles, electric lighting fixtures, substitute for glass in automobile and airplane windshields.

The resin has been made in a semi-commercial plant. A large plant is being constructed for production of the basic material at Charleston, W. Va. It will be shipped to Arlington, N. J., where it will be polymerized or converted from a liquid to a plastic solid.

Production of synthetic resins
(Chemical Division, Dept. of Commerce)



GLASS AND CERAMIC INDUSTRIES

USED → TO MAKE

GLASS

2,334,887 Tons	Silica Sand
664,006 Tons	Soda Ash
216,074 Tons	Lime
162,050 Tons	Limestone
103,499 Tons	Feldspar
41,189 Tons	Salt Cake
11,600 Tons	Fluorspar
559,117 Tons	Grinding Sand

CERAMICS

1,633,372 Tons	Fireclay
90,489 Tons	Ball Clay
35,460 Tons	Stoneware Clay
70,000 Tons	Kaolin
4,316 Tons	Slip Clay
Other Clays and Shale Not Reported	
91,944 Tons	Feldspar
1,834 Tons	White Lead
6,751 Tons	Litharge
867 Tons	Red Lead
3,000 Tons	Salt

Glass: U. S. Census, 1935, and Bureau of Mines
Ceramics: Bureau of Mines and Chem. & Met.

GLASS

Flat Glass	682,535,000 Sq.Ft.
Value $68,266,602	
Glassware	9,800,000 Gross
Value $67,442,258	
Containers	40,962,000 Gross
Value $124,492,570	

CERAMICS

Brick, etc.	3,000,000 M (est.)
Building Tile, etc.	2,067,166 Tons
Floor Tile, etc.	62,695,765 Sq.Ft.
Plumbing Fixtures	$12,969,481
Stoneware, Including Chemical	$2,195,715
Whiteware and Electrical	$25,867,644
Miscellaneous Pottery	$10,956,302
Total Value	$168,695,101

Based on U. S. Census, 1935

BUSINESS has been booming in the year just past in most branches of the glass and ceramic industries. Perhaps not booming in comparison with, say, 1928 and 1929, but at a high level nevertheless, as is shown both by the available indicators and by the opinions of producers in those industries. Despite the strikes which nearly crippled plate glass manufacturers during the last two months of the year, production stood at a level at least 35 per cent above 1929, and 100 per cent above what is generally considered normal, the 1923-25 average. For the entire glass industry, employment returned to 101 per cent of 1929, and wages to 83 per cent. Glass ware factories operated at high levels in comparison with recent years, while the production of containers was higher by almost 70 per cent than in 1932.

Glass has staged a more striking return than the clay products industries, but here too, great improvement is evident. Shipments of common brick were nearly 250 per cent of 1934, and of vitrified paving brick, 114 per cent. Production of ceramic bath room fixtures was close to 270 per cent of 1932. Employment and pay rolls lagged, however, in the brick, tile and terra cotta industry, standing respectively at 49 and 42 per cent of 1929.

One branch of the ceramic industry that has been progressing rapidly is porcelain enameling which has reached new high levels since the depression. On the technical side, the development of a new continuous frit smelter has given impetus to production advances, while on the marketing side, new uses have aided materially in stepping up consumption.

Probably no recent technical advance in the glass industry will contribute a more important effect in the near future than the development of the fibrous glass industry which in the past two years has come into prominence under the auspices of two leading glass producers. The new glass filaments, which are far finer than any produced by the old spun glass processes, are blown from the molten material in much the same manner as rock wool. And like rock wool, they have found a ready market in heat and sound insulation where the extremely low density of the fibrous mass, in the order of 1½ lb. per cubic foot, gives it an advantage in some particulars over other insulating materials. By methods similar to those used for cotton textiles, the new fibers can be carded, spun and woven into fabrics for filtering purposes, or the threads can be used for electrical insulation.

Another development which will probably increase the ultimate consumption of glass, and will certainly increase the quantity that is ground and laminated, is the discovery of the polarizing glass, Polaroid, which was announced and first commercialized during 1936. This material, which is a sandwich of a cellulose acetate film containing oriented dichroic crystals of a synthetic organic chemical substance, between sheets of glass, has for the first time made possible obtaining at reasonable cost large

(Please turn to page 99)

LEATHER INDUSTRY

USED

LEATHER

123,000,000	Hides, Skins, etc.
78,000 Tons	Lime
11,000 Tons	Sodium Sulphide
5,000 Tons	Lactic Acid
170,000 Tons	Tanning Extracts
3,000 Tons	Sulphuric Acid (50 deg.)
350,000 Tons	Salt
4,500 Tons	Sodium Bichromate
13,000 Tons	Sodium Thiosulphate
2,000 Tons	Borax
11,000 Tons	Oils and Fats
2,500 Tons	Dyes
50,000 Gal.	Alcohol

GELATINE AND GLUE

Bone, Hide Scraps, etc.	
50,000 Tons	Hydrochloric Acid (20 deg.)
14,000 Tons	Sulphuric Acid (50 deg.)
45,000 Tons	Lime

Chem. & Met. estimates
Correction: 13,000 tons sodium bichromate

TO MAKE

LEATHER

Harness, etc.	19,345,732 Lb.
Skirting, etc.	13,160,332 Lb.
Sole and Belting	254,485,714 Lb.
Upper	708,870,000 Sq.Ft.
Bag, Upholstery, etc.	69,676,071 Sq.Ft.
Lining	97,237,000 Sq.Ft.
Glove and Garment	124,010,225 Sq.Ft.
Fancy	35,520,047 Sq.Ft.
Splits and Miscl.	147,485,000 Sq.Ft.

Patent, Value $5,068,492
Total Value $292,617,487

GELATINE AND GLUE

Animal Glue	92,325,806 Lb.
Edible Gelatine	20,780,571 Lb.
Non-edible Gelatine	2,953,860 Lb.
Crude Bone Phosphate	20,000 Tons

U. S. Census, 1935, and estimates

ACTIVITY in the leather industry in 1936 was practically on a par with the preceding year, with a slight advantage over 1935. Although dollar value of the industry's products was considerably less than in 1929, which was a year of high leather prices, the quantity of leather tanned was only slightly less, and substantially the same as in 1935. Pay rolls in 1936 were equal to those of 1929, and employment was actually at a slightly higher level.

More definite information in regard to the recent history of the leather industry is to be found in the statistics of the 1935 Census of Manufactures. During 1935 the industry produced an output valued at $308,344,763, compared with $481,340,299 in 1929, $271,137,694 in 1931 and $237,202,248 in 1933. During the interval the number of establishments reporting decreased from 471 to 384.

Closely allied to leather, the glue and gelatine industry has had a similar experience during the depression and recovery period. All products of the industry, including vegetable, casein and fish glues, were valued at $32,458,019 in 1929, $27,515,739 in 1931, $17,162,712 in 1933 and $28,161,033 in 1935. Animal glue in 1929 amounted to 106,380,612 lb., and 92,325,806 lb. in 1935. Edible gelatine was produced to the extent of 18,423,304 lb. in 1929, and 20,780,571 lb. in 1935. The record for inedible gelatine was similar, with 1,712,799 lb. produced in 1929, and 2,953,869 lb. in 1935.

(Continued from page 98)

transparent surfaces capable of polarizing light. The material is already on the market in the form of sun glasses and for certain optical purposes, while its sponsors look toward its widespread use in automobile windshields and head lamp lenses, for the purpose of eliminating glare; in the projection and viewing of three-dimensional motion pictures; and for many industrial and scientific purposes.

For several years the heavy clay industry has been availing itself to an increasing extent of machinery for de-airing clay. This development has now penetrated into the white wares industry where its application is being carefully studied. In the refractories industry, new developments have taken place in several directions, notably in the advent of new insulating refractories. Use of extraordinarily high pressures in the forming of shapes has made possible the development of new unfired refractories which not only decrease the time in manufacture from weeks to days, but offer advantages in use.

It has been demonstrated in recent months that the primary kaolin deposits of North Carolina can be so treated by beneficiation methods as to provide a material equal to the best English china clay. This work, carried out by the Tennessee Valley Authority in cooperation with private and certain public agencies, has led to two commercial developments which within a few months will have a combined refining capacity considerably over 100 tons per day. Other work by the Authority has given encouraging results in the electric firing of ceramic ware, seeming to show that technical problems have largely been overcome, and that with power at substantially the T.V.A. rate, electric firing of porcelains is entirely practical.

Naval Stores Industry Stabilized By Restricted Output

PRODUCTION of gum rosin and turpentine was considerably curtailed last year and the restricted output had much to do with stabilizing prices. Spirits of turpentine was in ample supply and varied in price according to swings in buying volume but a decidedly upward trend was in evidence in the market for rosin and the year closed with the trend still unchecked. For a long time the market for rosin and turpentine has been adversely affected by decreased buying on the part of foreign countries and by the subnormal position of domestic consuming industries. With production spread over a large number of independent operators the annual was held up to normal volumes with the inevitable result of a piling up of stocks. For a part of 1935, production was along lines of directed curtailment with a partial recovery in values. The importance of maintaining a balance between production and consumption was thus clearly demonstrated and influenced producers to hold down output throughout the last year. Furthermore, steps have been taken to keep 1937 operations in line with those followed last year and unless the lure of higher prices disarranges this plan, another year of controlled output would create a strong statistical position.

It was regarded as of bearish significance that large stocks of both turpentine and rosin hung over the market as a result of stocks held by the Commodity Credit Corporation which had taken the goods in connection with loans advanced through the crop reduction program sponsored by the government. Officials of the corporation, however, proceeded to liquidate these holdings in such a way that no pressure was brought to bear on the market and this carryover thus handled became less of a threat than would have been the case if they had been in private hands. The entire holdings of the corporation were not disposed of and the method of gradual liquidation probably will be adhered to this year with no price-depressing effect. The amounts unsold at the end of the year were relatively small and complete liquidation is expected to be effected in a short time.

As stocks of gum rosin at the end of the year were about 200,000 barrels below the totals at the beginning of the year, a further decline in inventories would undoubtedly follow this year if production is maintained at the 1936 rate. The entire price structure, therefore, rests upon the rate of output with prospective demand favoring wider distribution.

Wood Rosin and Turpentine

The growing importance of wood rosin and wood turpentine is attested by the gains in production last year. The output of gum rosin was reported at 661,047 barrels in comparison with 550,152 barrels in 1935. For wood turpentine the production figures were 104,396 and 84,243 barrels for 1936 and 1935 respectively. In both cases production appears to be on a fairly stable basis free from seasonal influences.

Wood rosin and turpentine also entered into export trade in a larger way last year with figures for the first 11 months showing an outward movement of 295,126 barrels of wood rosin which exceed the 12 months total of 276,406 barrels for 1935. A similar condition is found in the case of wood turpentine with 27,421 barrels exported in the January-November period last year and only 18,900 barrels shipped in the entire calendar year of 1935.

World Developments

Bounties on exports of domestic rosin from France were suspended in December by the French Naval Stores Commission, due to the excellent export season enjoyed by that branch of the naval stores industry, the Commerce Department reported.

The bounty on turpentine, however, was continued as that branch of the industry did not fare so well.

Naval stores developments of considerable importance occurred in different parts of the world during the year just ended, outstanding of which, perhaps, were the crippling of Spain's industry by revolutionary activities and the alleged emergence of Russia as one of the world's largest producers, according to a survey made by the Commerce Department's Chemical Division.

Other developments of interest according to the survey were Germany's efforts to restrict consumption and increase domestic production; France's foreign trade efforts; endeavors of Greece to improve the quality of its product; and nationalization of the Portuguese industry.

The French naval stores year closed in November during which the scrape crop of crude gum was collected under favorable weather conditions. Trade estimates place the 1936 output of rosin at 66,200 metric tons against

Receipts of Gum Rosin and Turpentine at Three Southern Ports

	Gum Rosin 500-lb. bbl.	Gum Turpentine 50-gal. bbl.
1932	852,521	220,272
1933	979,569	257,688
1934	1,024,536	247,403
1935	952,424	225,528
1936:		
Jan.	41,226	3,808
Feb.	23,348	1,442
March	32,002	4,800
April	58,894	15,157
May	82,736	23,470
June	97,781	27,418
July	108,648	29,810
Aug.	101,939	26,173
Sept.	95,693	21,894
Oct.	81,814	18,533
Nov.	70,372	14,457
Total	794,453	186,962

Production of Wood Rosin and Turpentine

	Wood Rosin 500-lb. bbl.	Wood Turpentine 50-gal. bbl.
1932	341,947	55,952
1933	430,164	68,440
1934	505,224	81,685
1935	550,152	84,243
1936		
Jan.	52,156	9,042
Feb.	52,693	8,740
March	51,326	8,580
April	54,209	8,662
May	53,640	8,636
June	52,418	8,093
July	55,151	8,523
Aug.	58,572	8,785
Sept.	57,789	8,578
Oct.	57,809	8,731
Nov.	58,023	8,866
Dec.	57,261	9,160
1936 total	661,047	104,396

Exports of Gum and Wood Rosin and Turpentine

	Rosin 500-lb. bbl.			Turpentine 50-gal. bbl.		
	Gum	Wood	Total	Gum	Wood	Total
1932	937,699	159,965	1,097,664	218,794	10,579	229,373
1933	994,063	218,951	1,213,014	267,758	17,020	284,778
1934	793,718	231,264	1,024,982	195,789	17,855	213,644
1935	918,302	276,406	1,194,708	207,602	18,900	226,502
1936						
Jan.	65,920	18,487	84,407	13,182	1,827	15,009
Feb.	62,671	24,564	87,235	11,185	1,398	12,583
March	86,846	26,204	113,050	12,669	2,169	14,838
April	71,824	25,950	97,774	22,882	1,783	24,665
May	72,914	23,372	96,286	19,252	1,517	20,769
June	77,473	21,470	98,943	23,101	4,360	27,461
July	92,078	43,316	135,394	30,022	2,036	32,058
Aug.	72,478	37,185	109,663	26,534	2,703	29,237
Sept.	58,375	28,114	86,489	22,660	3,674	26,334
Oct.	75,489	23,403	98,892	21,654	2,284	23,938
Nov.	63,456	23,061	86,517	24,684	3,670	28,354
Total (11 mo.)	799,524	295,126	1,094,650	227,825	27,421	255,226

65,067 tons in 1935 and the yield of turpentine increased from 5,783,400 gallons to 5,824,857 gallons.

In spite of substantial export bounties French turpentine met with stiff competition in world markets during the year. Exports during the first ten months of the year amounted to only 104,847 gallons compared with 151,446 gallons during the same months of 1935. Rosin, however, fared better, particularly in the last half of the year, during which French exporters were able to obtain a share of English and German business which formerly went to Spain. Exports during the first ten months increased to 30,165 metric tons from shipments aggregating 17,105 in the same months of 1935. French naval stores consumers are reported locally to be accumulating stocks in anticipation of higher prices, it was stated.

The Russian naval stores industry which is celebrating its tenth anniversary this year, has expanded rapidly in recent years, and according to Soviet claims is the world's third largest, its output being exceeded only by the United States and France. From a beginning of 413 tons of crude gum in 1926 the output expanded to 80,000 tons in 1935 and the program for 1936 called for an output of 100,000 tons of crude gum. The industry which is said to employ 70,000 workers is now supplying the entire domestic demand for both turpentine and rosin, according to Soviet claims.

The Portugese naval stores industry has likewise expanded rapidly in recent years, the output in 1935 aggregating 7,178 tons of turpentine and 35,402 tons of rosin. The industry was particularly active during the year just ended during which it enjoyed increased output and better demand both in the domestic and foreign markets. The entire industry was nationalized during the latter part of the year by Government decree which established a National Naval Stores Board that will have complete control over production and distribution of turpentine and rosin.

The crude gum output of Greece was expected to reach 25,000 metric tons during 1936, according to estimates. Better methods of distillation and earnest efforts on the part of distillers resulted in a substantial improvement in the average quality of the year's gum output, reports indicate.

While definite statistics relative to the British Indian naval stores industry are not available, three plants are known to be in production. With the exception of 5 to 6 hundred tons of rosin, which are shipped to England, the entire output is consumed locally. The output, however, is insufficient for domestic requirements, it being necessary to import both turpentine and rosin in considerable quantities.

Mexican naval stores producers have been informed by the Forestry Office that beginning next season the law requiring change from the American system of tapping to the French system will be enforced.

A survey was conducted in Italy during the year to determine the country's resources in resinous forests. Investigators reported rather favorably on the possibilities.

Production of Turpentine and Rosin by Classification

(Naval Stores Years Ended March 31)

	TURPENTINE			ROSIN		
	1936–37 Apr.–Sept. 6 mo.	1935–36 Apr.–Mch. 12 mo. 50-gal. bbl.	1934–35 Apr.–Mch. 12 mo.	1936–37 Apr.–Sept. 6 mo.	1935–36 Apr.–Mch. 12 mo. 500-lb. bbl.	1934–35 Apr.–Mch. 12 mo.
Gum	345,700	497,000	510,000	1,076,367	1,647,000	1,700,000
Reclaimed Gum	....	....	....	19,178	54,187	34,000
Steam Dist. Wood	53,736	88,875	77,494	332,392	575,304	495,122
Sulphate Wood	5,635	11,712	9,832	....	....	....
Dest. Dist. Wood	3,455	5,321	5,767	....	....	....
Total	408,526	602,908	603,093	1,427,939	2,276,491	2,229,122

Reported Consumption of Turpentine and Rosin

(Combined Gum and Wood Products)

	TURPENTINE			ROSIN		
	1936–37 Apr.–Sept. 6 mo.	1935–36 Apr.–Mch. 12 mo. (50-gal. bbl.)	1934–35 Apr.–Mch. 12 mo.	1936–37 Apr.–Sept. 6 mo.	1935–36 Apr.–Mch. 12 mo. (500 lb. bbl.)	1934–35 Apr.–Mch. 12 mo.
Abattoirs [1]	....	....	....	449	2,375	....
Adhesives and plastics [2]	132	749	....	11,019	26,662	....
Asphaltic products [1]	....	8	....	697	1,808	....
Automobiles and wagons	153	890	869	622	2,855	1,473
Chemicals and pharmaceuticals	4,620	1,346	802	35,408 [7]	3,370	3,056
Ester gum [3]	....	13	....	30,036	98,758	....
Foundries and foundry supplies	88	326	167	5,650	11,218	2,385
Furniture [4]	150	843	....	105	123	....
Insecticides and disinfectants [4]	144	600	....	3,210	5,357	....
Linoleum and floor covering	35	39	6	12,137	24,650	15,854
Matches	....	....	....	1,238	2,869	1,585
Oils and greases	225	225	191	21,024	34,345	31,833
Paint, varnish and lacquer	22,331	66,538	51,725	30,428	147,245	176,000
Paper and paper size	....	....	43	180,060	357,143	337,000
Printing ink	120	200	376	7,030	15,112	11,872
Railroads and ship yards [5]	1,765	3,875	718	140	242	60
Rubber [4]	90	1,114	....	1,133	2,544	....
Shoe polish and shoe materials [6]	4,177	10,234	12,678	4,609	9,871	1,130
Soap	....	125	200	150,453	278,750	283,465
Other industries	392	803	898	1,461	2,284	3,007
Total industrial reported	34,422	87,928	69,305	496,909	1,027,601	884,835
Not accounted for	....	264,928	277,969	....	259,812	239,216
Apparent U. S. consumption	....	352,238	347,274	....	1,287,413	1,124,051

Note: Since reports on industrial consumption for April–September, 1936 were received from only those industrial consumers whose combined reported consumption in 1935–36 was 67 percent of the total reported industrial consumption of turpentine and 82 percent of the rosin in 1935–36, no figures are given under "Not Accounted for" or "Apparent U. S. Consumption" for April–September, 1936.

[1] Included in "Other Industries" in 1934–35.
[2] Reported as "Sealing wax, pitch, insulation and plastics" in 1934–35.
[3] Included in "Paint and Varnish" in 1934–35.
[4] Not previously reported.
[5] Reported as "Shipyards and Carshops" in 1934–35.
[6] Figures on "Shoe Materials" other than "Shoe Polish" not previously reported.
[7] Includes for the first time rosin consumed in producers' plants in the production of unclassified derived products.

Supply, Distribution and Carryover of Turpentine and Rosin

(Naval Stores Seasons Ended March 31)

	TURPENTINE			ROSIN		
	1936–37 Apr.–Sept. 6 mo.	1935–36 Apr.–Mch. 12 mo. (50-gal. bbl.)	1934–35 Apr.–Mch. 12 mo.	1936–37 Apr.–Sept. 6 mo.	1935–36 Apr.–Mch. 12 mo. (500-lb. bbl.)	1934–35 Apr.–Mch. 12 mo.
Supply and Distribution						
Carryover April 1	230,136	191,359	132,265	765,807	978,930	928,654
Production	408,526	602,908	603,093	1,427,937	2,276,491	2,297,337
Imports	9,648	12,490	10,559	2,041	2,236	2,526
Available supply	648,310	806,757	745,917	2,193,744	3,257,657	3,160,302
Less carryover March 31	[1]	230,136	191,359	[1]	765,807	978,930
Apparent total consumption	[1]	576,621	554,558	[1]	2,491,850	2,181,372
Less exports	160,526	224,383	207,284	624,549	1,204,437	1,057,321
Apparent U. S. consumption	[1]	352,238	347,274	[1]	1,287,413	1,124,051
Production and Imports						
Gum	345,700	497,000	510,000	1,095,545	1,701,187	1,734,000
Wood	62,826	105,908	93,093	332,392	575,304	495,122
Imports	9,548	12,490	10,559	2,041	2,236	2,526
Total	418,174	615,398	613,652	1,429,978	2,278,727	2,231,648
Carryover (Stocks)						
Carryover April 1	230,136	191,359	132,265	765,807	978,930	928,654
Carryover March 31	[1]	230,136	191,359	[1]	765,807	978,930
Increase	....	38,777	59,094	....	....	50,276
Decrease	....	....	....	....	213,123	....

[1] Figures not available.

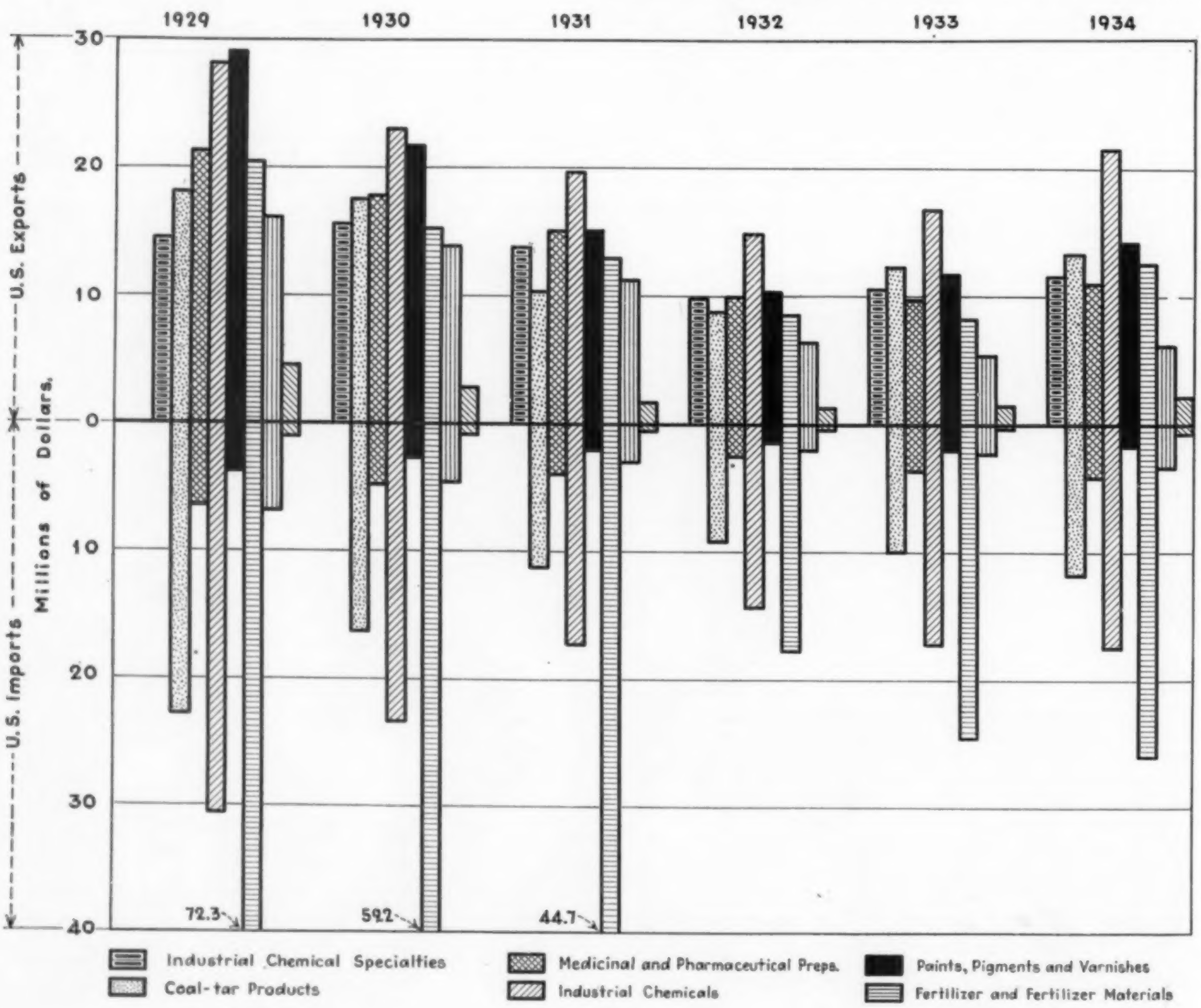
United States Holds Stable Position In World Chemical Trade

WORLD trade in chemicals and allied products, according to Department of Commerce figures, showed a very decided upward trend in 1936, with the United States having recorded the largest gains of the major chemical manufacturing and trading countries, according to official trade statistics with statistics for the full year not yet available, in comparison with those for a similar period of 1935. If comparisons are made with similar data 10 years ago, and if shipments for the last part of 1936 continued at the same rate, the same relative positions of the three major countries were held as at that time; Germany, however, probably will show a small increase in its exports; the United Kingdom may equal its 1926 figure; but the United States may register a decline. These statements are made from analyses of statistics based on dollars, and in 1926 the value of the German mark was much lower than in 1936, while the pound sterling of the United Kingdom was even. France, the next largest exporter is not discussed here but because of the recent rapid development of some branches of the comparatively new chemical industry of Japan, that country is discussed briefly. Japan, likewise, will record a substantial advance over the 1926 figure even though its currency is valued considerably lower than a decade ago.

The world-wide trend toward greater self-sufficiency for many products especially those designed to relieve national dependency upon foreign countries in times of emergencies continued in 1936 with redoubled force, especially in European and Far Eastern countries. Many new plants were reported under construction in the central and eastern European countries and the Italian government issued permits for erection of a number of plants. In the Far East, Japan was reported to be continuing its rapid development of an imposing chemical industry by expanding older plants and building many new ones. China and British India also have several new chemical plants already planned or under construction. In South America comparatively few plants have been reported and in Central America less than ten plants were added.

Compared with 10 years ago the number of plants manufacturing or assembling chemicals and allied products has

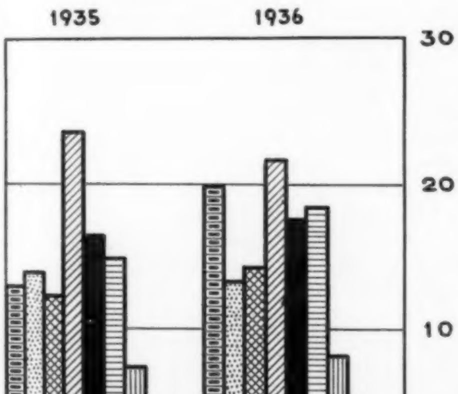
Trends in Foreign Trade in Chemicals and Related Products



increased greatly in all parts of the world, and the character of the trade in chemicals, therefore has changed somewhat. Briefly, it is believed that raw materials and industrial chemicals generally show very marked gains, while finished products such as perfumery and toilet preparations and some paint products record somewhat lessened foreign trade. The changes generally in world trade may be indicated by some comments regarding the United States trade.

Notwithstanding the rise of a few chemical items to more important positions in 1936, nevertheless for the most part the import trade of the United States is very similar to that of 10 years ago when, for example, sodium nitrate ranked first and in 1936 second in importance. Tung oil, the fifth largest chemical item in value imported in 1926 held first place in 1936; creosote oil, the second highest in value, has fallen to sixth place, and shellac in fourth place has dropped to a relatively minor position.

by Groups



In the export trade, even taking into consideration the much lower export prices of rosin and turpentine in 1936, these commodities hold important places in both years. Sulphur, caustic soda, benzol and coal-tar dyes, phosphate rock, disinfectants and insecticides, paint products and medicinals have remained in about the same relative positions; carbon black, coal tar and coal-tar pitch, borax, synthetic plastics have assumed much more prominence, and perfumery and toilet preparations, ammonium sulphate, ginseng, zinc oxide, dynamite, and superphosphates have dropped to relatively unimportant places. On the other hand, there has been decided progress made by formerly comparatively unfamiliar products in United States exports such as biologics, synthetic gums and resins, compressed and liquefied gases, solvents and other synthetic organic derivatives, and industrial chemical specialties, and particular recognition should be accorded to our new status as an exporter of potash.

Exports of chemicals and allied products from Germany increased nearly 6 per cent to $200,000,000 in the first 9 months of 1936 compared with the corresponding period of 1935. Notwithstanding numerous Government regulations in force to reduce all imports, chemicals and allied products advanced 6 per cent to $65,000,000, notable increases being in raw materials for which no entirely satisfactory synthetic or substitute products are yet made in Germany in sufficient amounts to supply the increased demand of the German manufacturers. The value gain recorded in 1936 in exports was the result of advances made in certain of the principal chemical groups, particularly in shipments of coal-tar products, heavy chemicals, nitrogenous fertilizers, and explosives. Although details of countries of destination are not available as yet for the past year, Germany increased its exports to almost all South and Central American countries considerably.

Exports from the United Kingdom changed less than 1 per cent and reached nearly $92,000,000 in January-September 1936, while imports of $74,000,000 were 7 per cent above the corresponding figure for 1935.

After the large gains in Japanese exports the past 3 years, only a 3 per cent increase was recorded in 1936 to a total of $23,000,000; imports into Japan, however, were up 30 per cent to $41,000,000, notwithstanding almost complete disappearance of some commodities formerly imported in large amounts, and notwithstanding the greatly augmented domestic manufacture. This marked increase in imports is partly explainable by price increases.

Japan not only extended its markets in the Far East and Africa, but gained some ground in the Western Hemisphere. In 1936, for example, large amounts of sodium silicofluoride and sodium ferrocyanide were imported into the United States from Japan for the first time. In the fall, sodium bicarbonate was shipped from Japan to Mexico which country was ordinarily supplied by the United States. Conspicuous increases were made in exports of the lines of comparative recent development in Japan such as medicinals, toiletries of all kinds and industrial chemicals such as sulphur, calcium carbide, bleaching powder, ammonium sulphate and calcium carbonate, while reductions occurred in the old established Japanese products menthol, camphor, and matches.

The Tariff Commission has issued a report under its general powers describing the extent to which foreign countries levy the same import charges at the customhouse on like products irrespective of country of origin. The report deals primarily with single and multiple tariff structures, treaties pledging most-favored-nation treatment as regards tariff rates, tariff reductions made by tariff agreements, and the application of such reductions either to the countries entitled thereto under the most-favored-nation obligation or to all countries by free generalization irrespective of that obligation. The report finds that of the treaties now in existence throughout the world, the great majority contains unconditional rather than conditional pledges of most-favored-nation treatment.

The report takes note of the fact that in a number of countries other measures affecting trade, such as exchange controls, quotas, import permit systems, and compensation and clearing agreements, have become so important as to lessen seriously the value of equal treatment in the matter of tariff duties. Where such restrictions exist an effort has been made to indicate briefly the character of the measures employed, the extent to which they have been used, and in some cases the extent to which the attempt has been made to follow the principle of equal treatment in their application. Despite the widespread adoption of these measures under stress of the business depression, it may not be concluded that, taking the world as a whole, tariffs are of little importance at the present time. The major part of world trade remains unrestricted or restricted only by tariffs.

The report covers the 20 Latin American countries and 22 others. Germany, Italy, and the Soviet Union are omitted because their foreign trade is so directly controlled by the Government as to render their policies with respect to tariff rates of little signifi-

cance. The policy of each country is described separately, but these descriptions are preceded by an introduction and summary of 43 mimeographed pages. It is expected later to print the report.

Chemicals and metals are expected to play an important role in the trade agreement with Ecuador, now being contemplated by the Department of State.

Work is now going forward on the preparation of lists of products to be considered in the proposed agreement, and American industry has been asked by the State Department to assist in the work by sending in suggestions for products which might be included in the agreement.

Formal announcement will be made later of the intention of the government to negotiate such a trade agreement, and at that time the dates for submission of briefs and applications for oral hearings as well as the dates for such hearings, will be given the public.

In the figures published by the Division of Foreign Trade Statistics Department of Commerce, the trade in metal and chemical products with Ecuador shows signs of resuming much of the importance it had prior to the depression slump. Included in the list of exports were coal-tar colors, dyes, agricultural insecticides, fungicides, household insecticides, acids and anhydrides, hydroxide, sodium compounds, industrial chemicals, chemical pigments, explosives, as well as large quantities of pharmaceuticals, soap, blasting caps and other chemical and related products.

Coal-Tar Products

Comparing our export trade in 1936 with the totals for the preceding year, but little change is noted in the coal-tar group taken as a whole. The volume of business expressed in dollars was somewhat in favor of 1935. Changes within the group were marked by a material gain in exports of crude and refined coal-tar. Benzol also was shipped out in larger volume and with a higher valuation despite a lowering in the unit price. The same was true for coal-tar pitch although the increase was of lesser degree.

Dyes, stains, and color lakes were exported to the extent of 19,630,924 lb. in 1935 and last year's shipments failed to come up to that total by approximately 3,000,000 lb.

Imports of coal-tar products carried a higher valuation last year. Very little change was reported for incoming shipments of dead or creosote oil but material gains were noted for other crudes and for coal-tar acids. Foreign intermediates found a smaller sale in this country and home-made dyes made it unnecessary to import dyes to the same extent as was done in the preceding year.

Industrial Chemical Specialties

This branch of the chemical industry recorded a sharp expansion in export trade last year with a value exceeding the 1935 figure by close to $8,000,000. In this division exports of pyroxylin products, cellulose acetate, rods, etc., nitro and aceto products, were given detailed treatment for the first time and while comparable data for 1935 are not available, it is certain that these products contributed a fair share towards the increased shipments as shown in the group total.

Among other products which found larger markets in foreign countries were nicotine sulphate, copper sulphate, calcium arsenate, other agricultural insecticides and fungicides, household and industrial disinfectants, deodorants, and germicides, petroleum jelly, dextrine, tobacco extracts, water softeners, purifiers, boiler and feed-water compounds, synthetic gums and resins, specialty cleaning and washing compounds and polishes.

Industrial Chemicals

Sales of industrial chemicals in foreign trade fell off in value compared with those for the previous year but with export prices reduced for many selections, there was no wide difference if adjustments are made for the variations in unit value. Among the acid group boric continued to improve its position with exports of approximately 9,500,000 lb. compared with 8,761,000 lb. in 1935. Methanol and glycerine fell below 1935 totals but butyl alcohol was shipped out more freely last year with a high rate of increase also for butyl acetate and acetone. Carbon bisulphide likewise found more favor abroad. Aluminum sulphate made an unfavorable showing compared with 1935 with a net loss of about 10,000 000 lb. Calcium chloride also failed to hold the rate of shipments reported for the year preceding. Outward shipments of citrate of lime were negligible last year although the 1935 total reached 1,578,800 lb.

Potassium compounds, not including fertilizer materials, reported a decline of about 2,600,000 lb. A similar situation existed in the case of sodium compounds with a drop of about 18,000,000 lb. from the 1935 shipments. Exports of soda ash, caustic soda, and bicarbonate of soda made a good showing but bichromates, cyanide, sal soda, and sodium phosphates lost ground in outside markets. Silicate of soda has been on a downward curve in export trade and continued along the same lines last year. A few years ago, Canada took the greater part of our export shipments of silicate of soda but the establishment of silicate production in that country has greatly curtailed importations and this condition appears to be permanent.

Import trade in industrial chemicals was on a higher scale with an increase of more than $4,000,000 in the value of consular invoices. Notable among the acid group was the resumption of shipments of tartaric acid which had all but ceased in 1935. In fact competition from imported tartaric acid was a factor in domestic markets during the year and had a depressing effect on values. Foreign shippers of sal ammoniac were more active during the year and arrivals at domestic ports were about 1,000,000 lb. larger than in

Export Trade in Chemicals, by Groups—1929–1936

	1936 11 mo.	1935	1934	1933	1932	1931	1930	1929
Coal-Tar Products	$12,236,611	$13,958,701	$13,264,095	$12,422,862	$8,752,230	$10,346,921	$17,556,312	$18,058,528
Medicinal and Pharmaceutical Preparations	12,946,315	12,239,340	10,973,153	9,816,253	10,026,617	15,103,936	17,800,996	21,282,411
Industrial Chemical Specialties	18,393,414	12,868,471	11,612,200	10,663,313	9,949,337	13,753,889	15,589,257	14,456,556
Industrial Chemicals	20,140,272	23,627,298	21,683,406	16,801,699	14,954,009	19,774,027	23,015,044	28,193,913
Pigments, Paints, and Varnishes	15,952,438	16,344,957	14,214,277	11,834,181	10,365,626	15,126,846	21,689,217	29,118,797
Fertilizers and Fertilizer Materials	17,077,006	14,809,035	12,543,126	8,268,968	8,652,526	13,011,323	15,284,315	20,444,015
Explosives, Fuses, etc	2,367,430	2,439,418	2,149,239	1,526,643	1,281,935	1,733,714	2,950,354	4,548,766
Soap and Toilet Preparations	7,306,268	7,207,696	6,179,686	5,435,716	6,421,623	11,282,502	13,969,863	16,058,680

Import Trade in Chemicals, by Groups—1929–1936

	1936 11 mo.	1935	1934	1933	1932	1931	1930	1929
Coal-Tar Products	$13,252,382	$13,557,765	$11,847,058	$9,997,089	$9,157,885	$11,162,846	$16,273,163	$22,823,597
Medicinal and Pharmaceutical Preparations	4,517,133	4,127,588	4,234,072	3,605,089	2,530,072	3,973,072	4,947,534	6,422,034
Industrial Chemicals	18,888,370	16,115,085	17,469,938	17,236,526	14,440,741	17,198,840	23,299,981	30,644,429
Pigments, Paints, and Varnishes	1,815,193	2,109,099	1,694,648	2,033,363	1,446,088	2,016,872	2,612,557	3,821,148
Fertilizers and Fertilizer Materials	29,906,381	28,560,775	26,029,247	24,573,695	17,858,152	44,732,851	59,150,894	72,339,774
Explosives	670,176	827,403	588,814	244,055	338,335	520,107	910,503	959,501
Soap and Toilet Preparations	2,598,961	3,387,857	3,203,835	2,184,346	2,005,214	3,027,694	4,719,396	6,940,773

1935. Copper sulphate is no longer of importance in import trade and failed to make any recovery last year. In fact our export trade in copper sulphate in the latter part of the year was held in check by the fact that the supply available was too small to fill all export inquiries.

Gain for Glycerine

Importations of both crude and refined glycerine gained in volume but foreign markets did not have enough exportable surplus to push exports up to a point where they would relieve the shortage in the American supply. Magnesium registered a sharp advance with arrivals outstripping those for 1935 by about 3,750,000 lb.

For potashes, foreign material held about the same position as in 1935 but imports of carbonate were lower with very little change reported for chlorate and perchlorate. Cream of tartar was not imported in a large way but was far above the 12-lb. total reported for 1935. Argols, tartar, and wine lees held an unchanged position.

Enlarged demands for salt cake found a reflection in the import trade with a gain of about 45,000 tons in domestic receipts. Anhydrous sodium sulphate, despite the duty, recorded a sharp gain over the 1935 shipments.

A marked gain was noted in foreign shipments of yellow prussiate of soda but foreign nitrite did not seem to be in a competitive position as less than 2,000 lb. was shipped to this country. For the first 11 months of 1936 imports of phosphates of soda were 584,969 lb. compared with 179,924 lb. for the entire year of 1935 which shows the extent to which this material competed with domestic products last year, despite the low prices which were in effect.

Pigments, Paints and Varnishes

For the pigment group a moderate appreciation in foreign business was indicated by the figures for export. Mineral pigments made a favorable showing with foreign markets taking larger amounts of ocher, umber, sienna, whiting, barytes, etc. In the chemical pigments, lithopone made progress but zinc oxide and lead pigments failed to equal the shipments of the year before. A moderate gain was made in carbon black in spite of restrictions placed on importations into Germany in the latter part of the year. Gains also were reported for paste paints, kalsomines, nitrocellulose lacquers and varnishes with practically no change in the relative position of ready mixed paints.

Importations of mineral earth pigments fell off in both volume and value and a smaller amount of chemical pigments reached this country. Arrivals of lithopone and zinc sulphide ran counter to the general trend and gained in volume but zinc oxide was less conspicuous.

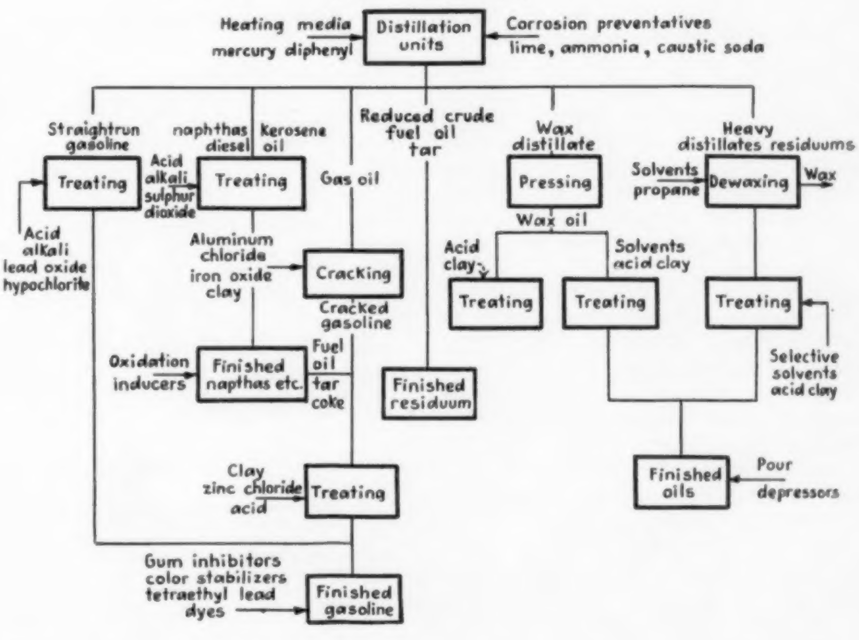
Fertilizer and Fertilizer Materials

Expansion in foreign trade in fertilizers is indicated by the fact that the tonnage movement to outside countries last year was close to 15 per cent larger than it was in 1935. The largest gain was made in the case of sulphate of ammonia with 1936 shipments about one-third larger than they were the year before. Exports of nitrate of soda did not fare so well and fell below 1935 levels by less than 10,000 tons. Phosphate fertilizer materials made a very satisfactory advance this holding true for high-grade hard rock, land pebble, and superphosphate. A notable feature in the export trade in fertilizer materials consisted in an increase of close to 40 per cent in sales of potash fertilizers for foreign consumption.

Imports of fertilizer materials made equally good showing with domestic buyers taking on larger amounts of practically every classification. Imports of sulphate of ammonia more than doubled those for 1935. Nitrate of soda made a fair gain with the same true for ammonium-nitrate mixtures, calcium cyanamide, calcium nitrate and urea. The potash group offered an exception as domestic buyers cut down their requirements for chloride, kainite, sulphate, and manure salts which points to a wider use of the domestic product.

While different reports have been heard about developments in sulphur production in foreign countries, this was in evidence judging by the volume of our export trade which increased last year by about 50,000 tons.

Where Chemicals Are Used in Petroleum Refining
(Keith and Forrest)



Paint, Varnish, Lacquer, and Fillers—Summary of total sales by 579 establishments, by months, 1928-1936

Bureau of the Census

Month	1936	1935	1934	1933	1932	1931	1930	1929	1928
January	$23,803,627	$20,835,518	$20,141,156	$11,199,240	$15,888,855	$20,310,784	$26,617,208	$30,824,446	$29,195,290
February	20,180,869	21,229,132	17,287,724	11,565,136	16,262,576	20,894,853	28,364,474	30,846,424	30,750,617
March	29,912,407	26,544,245	22,627,382	13,472,526	19,079,705	26,742,550	32,796,286	39,750,854	37,197,643
April	36,209,030	32,851,225	27,116,692	18,914,864	22,601,920	31,851,281	38,459,583	43,042,015	38,157,393
May	40,949,831	36,160,067	32,991,160	26,029,578	24,972,762	33,383,847	37,006,677	46,200,757	45,201,906
June	38,735,681	32,325,512	28,154,013	27,602,184	19,624,641	28,571,399	36,476,680	41,362,280	41,672,728
July	33,919,137	28,975,289	22,942,907	21,878,744	14,376,301	22,589,377	29,243,951	38,006,714	33,422,736
August	33,380,037	28,501,654	23,771,319	20,372,499	15,975,278	21,303,007	27,916,739	42,071,846	38,145,686
September	33,449,725	28,536,075	21,714,509	18,903,549	16,751,179	21,925,486	28,149,101	36,484,869	34,890,361
October	34,048,582	32,853,356	23,652,268	18,614,304	15,536,898	20,726,978	26,553,618	35,888,912	35,995,828
November	28,502,938	25,426,631	19,801,013	15,937,120	12,424,213	16,479,234	19,895,890	28,148,862	29,871,495
December	29,464,601	20,038,905	16,005,974	15,814,149	9,426,271	13,476,516	16,672,485	22,189,467	26,012,788
Total	$382,556,555	$334,277,609	$276,206,117	$220,303,893	$202,920,599	$278,255,312	$348,152,692	$434,817,446	$420,514,471

Salt Cake Used in Larger Volume Last Year

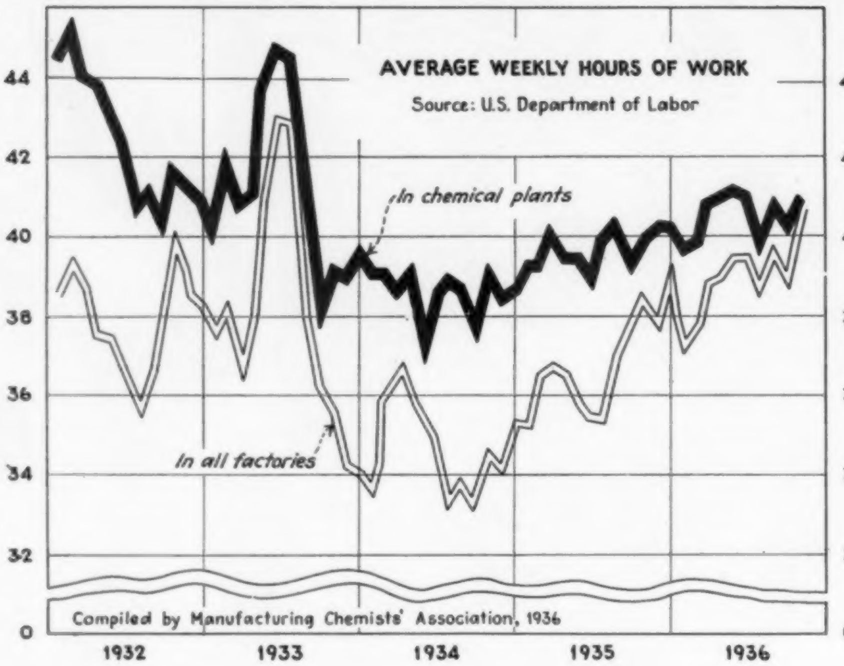
THE general improvement in the production schedules of the sulphate pulp mills during the last year or so called for a considerable increase in the tonnage of salt cake consumed. Domestic production and the tonnage of salt cake imported show a decided upturn during 1936 according to G. A. Gardner in a report to the Technical Association of the Pulp and Paper Industry.

Most of the imported salt cake came from Europe although considerable quantities were imported from natural deposits located in Western Canada. Natural deposits and brine wells located in various parts of the United States and Canada are becoming increasingly important as sources of supply and they are turning out an excellent quality of salt cake, which is finding a ready market among buyers, particularly in the Northwestern mills and on the Pacific Coast. The main difficulty in securing salt cake from these natural sources lies in the excessive cost of transportation. With the increase in the production of sulphate pulp in the United States salt cake is becoming of greater importance as a raw material, and it is interesting to note that there is a possibility of the development of a new use for it. It appears that patents have been recently granted to a large chemical concern in Europe for a process designed to produce caustic soda and sulphuric acid by electrolysis from aqueous solutions of sodium sulphate, and pilot plants have already been put into operation with most satisfactory results.

Most of the sulphate mills, however, are now equipped with some sort of an alkali recovery system and there can be no doubt that the newer types of these systems are most effective in preventing losses of alkali which formerly constituted an appreciable loss of raw material to the sulphate pulp manufacturer, and also reducing the quantity of salt cake used per ton of pulp produced.

Salt cake, produced from so many different sources naturally varies considerably in quality. However, the standard adopted by the pulp manufacturers in recent years calls for a product testing 95 per cent minimum Na_2SO_4 as they have found that they can get better results with a uniform quality, the chemical composition of which they can depend upon.

During the last two or three years there has been very little change in the price of salt cake. Contracts for 1937 were made at about the same basic price as for 1936. Purchasers of salt cake, however, are taking into consideration in connection with their future requirements not only the additional demand from new mills under construction, but also the rising tendencies that have been so apparent in commodity markets.



Census Data—1935-1933

Production of Acetylene and Calcium Carbide

	1935	1933
Acetylene:		
Number of establishments	116	108
M cubic feet	1,133,824	754,089
Value	$14,747,854	$11,038,059
Calcium carbide:		
Number of establishments	6	7
Tons	147,092	108,488
Value	$6,234,380	$6,059,205

Production of Potassium Hydroxide

	1935	1933	1929
Potassium hydroxide (caustic):			
Number of establishments	[1] 4	4	3
Tons	[2] 9,518	9,348	4,818
Value	$1,260,031	$868,000	$580,765

[1] New York, 3 establishments; California, 1.
[2] 1935 production, basis 100 per cent; for other years as reported, regardless of strength.

Production of Sodium Sulphates

	1935	1933
Total made for sale, value	$4,260,941	....
Anhydrous sodium sulphate (refined):		
Number of establishments	8	(1
Tons	23,609	(2)
Value	$457,890	(2
Glauber's salt:		
Number of establishments	19	19
Tons	[3] 40,735	39,804
Value	$549,220	$586,057
Hyposulphite (thiosulphate):		
Number of establishments	8	8
Tons	24,477	18,211
Value	$1,054,264	$763,476
Niter cake:		
Number of establishments	16	20
Total production, tons	27,933	30,558
Made and consumed in same establishments	9,348	13,546
Made for sale:		
Number of establishments	13	18
Tons	18,585	17,012
Value	$342,132	$352,512
Salt cake		
Number of establishments	27	28
Tons	[4] 169,197	114,610
Value	$1,857,435	$1,471,278

[1] Not tabulated separately.
[2] Withheld to avoid disclosing approximations of data for individual establishments.
[3] Includes refined Glauber's salt made from natural product.

Production of Pyroxylin-Coated Textiles

Monthly statistics relating to pyroxylin-coated textiles, based on data from twenty manufacturers comprising most of the industry, released by Director William L. Austin, Bureau of the Census, Department of Commerce. The data include products manufactured by spreading nitro-cellulose or pyroxylin preparations, either by themselves or in combination with other materials, upon gray goods, such as sheetings, drills, ducks, sateens, moleskins, etc.

Item	1936 November	1936 October	1935 November	1934 November	Total, 11 months (January-November) 1936	1935	1934
LIGHT GOODS:							
Shipments —							
Linear yards	3,199,265	3,241,972	2,460,983	1,701,031	32,490,448	28,185,467	20,016,370
Value	$795,768	$834,687	$633,340	$459,777	$7,985,775	$6,967,250	$5,288,244
Unfilled orders [1] —							
Linear yards	1,695,798	1,574,046	1,328,669	1,199,505	....	....	....
HEAVY GOODS:							
Shipments —							
Linear yards	1,894,251	2,166,053	1,622,910	1,132,336	19,734,961	17,558,569	16,216,911
Value	$1,031,427	$1,173,585	$890,462	$613,866	$11,013,499	$9,474,891	$8,915,028
Unfilled orders [1] —							
Linear yards	988,401	836,358	971,671	1,788,204	....	....	....
PYROXYLIN SPREAD [2]:							
Pounds	5,320,813	6,080,964	4,152,450	3,256,530	56,515,146	47,669,436	39,616,106
MONTHLY CAPACITY (new basis) [3]:							
Linear yards	7,368,105	7,368,105	7,298,106	7,298,106	....	....	....

[1] Orders on hand at the close of the current month (reported in yards only) exclusive of contracts with shipping dates unspecified.
[2] Based on 1 lb. of gun cotton to 7 lbs. of solvent, making an 8-lb. jelly.
[3] Based on maximum quantity of 1.27 to 1.30 sateen, coated to a finished weight of 17½ ounces per linear yard, in a month of 350 working hours.

Sales of Carbon Black Made New Record

RECENT reports concerning the erection of new plants in the South for production of carbon black have directed attention to the growing importance of this product. In 1929, production reached its highest point with a total output of 366,442,000 pounds. In 1935, production was 352,749,000 pounds—exceeded only by the totals for 1929 and 1930. Official figures are not yet available for operations in 1936 but export trade was equal to that reported for the preceding year and domestic consumption was above the 1935 level so that shipments from producing works undoubtedly registered an increase for the year. With prospects favoring larger domestic consumption and with new plants ready to operate for at least a part of the period, a new record for production seems to be assured.

Sales of carbon black in 1935 amounted to 387,536,000 pounds which was in excess of production and was the largest total ever sold in one year. Of the amount sold for domestic use, 213,708,000 pounds, 87 per cent went to rubber companies, 6 per cent to ink companies, 3 per cent to the paint and varnish companies, and 4 per cent for miscellaneous products. The increase in consumption was attributed to larger purchases for rubber and miscellaneous products with no material change in the ratio taken by paint companies and with a drop in the percentage consigned to ink companies. As rubber consumption was larger in 1936 than it was in 1935—and this applies to tire production—carbon black should have had a larger use in that industry last year. This holds also for paint and ink manufacture and apparently a new record for sales was established.

Export trade in 1935 accounted for 37 per cent of total sales. In spite of a decree designed to curtail imports into Germany, that country took on larger amounts last year than in 1935. Recent reports, however, indicate that Germany is making progress in developing a home supply of carbon black and our export outlook for the present year does not appear to be so good as it was a year ago.

Production of Bone Black and Carbon Black

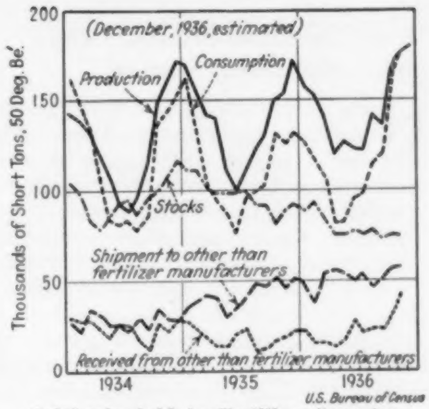
	1935	1933
Bone Black, Carbon Black, and Lampblack industry, all products, total value	$14,811,298	$8,506,709
Bone black, carbon black, and lampblack	14,650,255	7,732,473
Other products, not normally belonging to the industry	161,043	774,236
Bone black, carbon black, and lampblack made as secondary products in other industries, value	697,768	[1] 908,177
Bone black, carbon black, and lampblack, total:		
Pounds	388,178,082	299,259,897
Value (sum of 2 and 4)	$15,348,023	[1] $8,640,650
Bone black:		
Pounds	31,847,653	23,122,671
Value	$1,259,584	$828,596
Carbon black:[2]		
Pounds	352,749,000	[1] 273,125,000
Value	$13,755,000	[1] $7,602,000
Lampblack:		
Pounds	3,581,429	3,012,226
Value	$333,439	$210,054

[1] Revised.
[2] From reports of U. S. Bureau of Mines.

Larger Production and Sale of Liquid Chlorine

A STEADILY rising curve has featured production of liquid chlorine in the last few years. Larger outputs have been necessary because of the rise in consumption. The growth in the synthetic organic chemical industry has been a factor in this development and an expansion in the use of chlorine for water purification and for sanitation also has aided materially in increasing distribution of the chemical. Additional plant capacity has followed the consumption trend and in the latter part of last year it was estimated that the daily output of domestic plants had been speeded up to 1,100 tons.

Census figures credit an output of liquid chlorine amounting to 319,000 tons in 1935 and production in 1936 was considerably higher with a probable output of about 360,000 tons. The 1935 production is estimated to have been distributed as follows:



Sulphuric Acid in Fertilizer Industry

	Tons	Per Cent of total
Pulp and paper	146,000	45.77
Chemicals	125,000	39.19
Sanitation	30,000	9.40
Textiles	11,000	3.45
Miscellaneous	7,000	2.19
	319,000	100.00

Production of Glue, Gelatin and Casein

Kind	1935	1931	1929
Glue and gelatin, all industries, aggregate value	$26,220,968	$27,653,180	$32,196,158
Glue:			
Animal:			
Lb.	92,325,806	89,400,156	106,380,612
Value	$9,333,642	$13,385,282	$15,141,433
Vegetable:			
Lb.	126,792,581	102,511,167	133,152,385
Value	$5,204,473	$4,067,468	$6,141,686
Casein:			
Lb.	13,415,276	2,787,406	2,652,840
Value	$1,555,083	$329,523	$425,035
Flexible and fish:[1]			
Lb.	11,763,502	10,236,507	10,281,013
Value	$1,936,829	$2,057,681	$2,430,519
Gelatin:			
Edible:			
Lb.	20,780,571	15,199,452	18,423,304
Value	$6,883,880	$5,980,469	$7,514,488
Inedible:			
Lb.	2,953,869	3,150,199	1,712,799
Value	$1,307,061	$1,832,757	$542,997

[1] Figures combined to avoid disclosing approximations of the output of individual manufacturers of fish glue.

Coal-Tar Dyes in Pounds: United States Production by Colors and Classes of Application, 1935

(U. S. Tariff Commission)

	Blacks	Blues	Browns	Greens	Oranges
Acid	3,385,096	2,613,233	475,566	656,248	1,790,774
Basic	23,670	949,879	723,109	282,970	659,385
Direct	12,994,624	3,122,522	2,253,325	944,180	749,063
Acetate silk	649,127	367,568	6,983	....	174,862
Lake and spirit-soluble	930,860	96,073	4,038	2,365	297,438
Mordant and chrome	3,760,872	184,313	858,472	119,150	35,612
Sulphur	12,067,262	1,620,154	1,997,171	217,857	29,661
Vat	602,819	22,063,302	1,646,796	799,488	700,822
Unclassified	....	....	....	....	....
Total	34,414,330	31,017,044	7,965,460	3,022,258	4,437,617

	Reds	Violets	Yellows	Total
Acid	2,644,261	671,276	2,033,377	[1] 14,269,831
Basic	808,735	1,008,600	932,710	5,389,058
Direct	3,024,903	442,030	2,542,792	26,073,439
Acetate silk	220,214	98,653	239,658	[2] 1,963,276
Lake and spirit-soluble	587,144	2,804	160,290	2,081,012
Mordant and chrome	664,405	17,035	624,274	6,264,133
Sulphur	789,704	....	227,334	6,949,143
Vat	494,062	383,698	1,217,309	7,908,296
Unclassified	....	....	....	710,555
Total	9,233,428	2,624,096	7,977,744	[1] [2] 101,608,743

[1] Food dyes not included.
[2] Includes 206,211 lbs. not classified by color.

New Chemical Products and Processes Used Abroad

NEW products and new processes touching all branches of the chemical industry and designed to protect health as well as free countries from dependence upon outside sources for national necessities, were reported from many parts of the world during 1936, according to reports received at Washington.

From Germany reports were received regarding a preparation which is claimed to prevent seasickness, and an improved diphtheria vaccine, in Japan, a smallpox vaccine, a sleeping-sickness serum, and a new worm expellent were produced; in India it was claimed that snake venom in the treatment of cholera was being used with good results; in Czechoslovakia the State Serological Institute introduced a snake-bite serum for distribution to tourists, and narcotics were being extracted from empty poppy heads; and from England, the first factory for the manufacture of synthetic vitamins on a large scale was reported.

Among other new products introduced to the German market were activated carbon paints suited for primary coats as well as finishing colors; a rosin ester; a white lead pigment; an ink made from crude manganese dioxide; an enamel with artificial resin base; artificial "enzymes," used as vulcanizing accelerators; a photographic film which produces diapositives in natural colors; a treated peat fertilizer; and another fertilizer material known as "magnodoppelsalz."

Japan brought out a non-coloring enamel made from urea resin, and a chemical, "Sofna," for rendering tough meats and other foodstuffs tender.

In England the commercial production of three new flameproofing chemicals was established; an enamel containing rubber for use on woodwork, walls and ceilings was placed on the market; and eight coronation colors were sponsored by the British Colour Council.

In Czechoslovakia a chemical which develops and fixes a picture in one operation was introduced. An insecticide made from Greenland cryolite was reported to have been sold in considerable quantities.

Among new uses developed during the year were included the preservation of milk and butter with oxygen in Germany; the utilization of sulphuryl chloride for preserving fodder in Finland; the use of red mud for painting boat-sales, and tung oil for waterproofing paper raincoats in Japan. Germany was reported to be collecting grease from drain pipes to be used in the manufacture of soap.

Among new processes were reported a method of producing sulphuryl chloride in China; benzol from naphthalene in Japan; gas black from naphthalene in Germany; tartaric acid from grapevines in Russia; new processes for making Glauber's salt and benzyl acetate in Japan; and an improved process for evolving hydrogen and carbon monoxide in Germany. Germany also reported the use of zinc oxide for preserving hides and skins and a new chemical process for tanning sole leather.

A new color film was placed on the market at the turn of the year by Agfa (I.G.), which differs from previous film in being based not only on the "additive" but also on the "subtractive" color process. It renders a silver-free accurate color reproduction with the usual camera and projection apparatus without the use of the former coarse grain film or screen system and requires no color filters attached to the camera lens. The new film consists of thin emulsion layers, first a red-sensitive layer with blue green components, then a green sensitive layer with purple components, a yellow filter, and on top a blue-sensitive layer with yellow components. In order to make the film possible it was necessary to secure layers as thin as 0.005 mm. and 0.002 mm. in thickness; the three emulsion layers together are no thicker than on a normal film. An advantage claimed for the new process is that the developing of the film is quite simple and economical. So far the new film is procurable only for miniature camera and narrow moving picture film and costs but one-third more than regular film.

Operations at Ethyl Alcohol Plants, Fiscal Years, 1935–1936

	1935	1936
Number of plants operated	32	35
Number of bonded warehouses operated	74	72
Operations (proof gallons)		
Production	180,645,920	196,126,236
Removed to bonded warehouses[1]	180,831,628	195,981,603
Withdrawals, total[1]	183,095,759	199,938,800
Tax-paid	16,990,972	24,052,532
Tax-free, total	166,104,787	175,886,268
For denaturation[1]	163,009,786	172,478,748
For hospital and scientific use	1,496,283	1,565,114
For use of U. S. and subdivisions	852,615	993,734
For export	117,500	135,498
For medicinal and beverage use in Puerto Rico	628,603	713,174
Losses in warehouses	491,226	438,851
Losses in transit	64,041	47,877
Stocks in bonded warehouses June 30[2]	25,252,756	21,300,340

[1] Including 41,847 proof gallons in 1935 and 484 proof gallons in 1936 removed directly to denaturing plants by alcohol plants not having a bonded warehouse.

[2] Stocks in transit between bonded warehouses and quantities in receiving tanks of alcohol plants awaiting transfer to bonded warehouses not computed.

PRODUCTION OF ETHYL ALCOHOL

	Ethyl Alcohol 1936 1000 pr. gal.	Ethyl Alcohol 1935 1000 pr. gal.	C. D. 1936 1000 wi. gal.	S. D. 1936 1000 wi. gal.	C. D. 1935 1000 wi. gal.	S. D. 1935 1000 wi. gal.
Jan	13,179	12,290	958	5,248	1,171	4,875
Feb	12,748	9,767	747	5,191	531	4,082
March	13,899	12,844	473	5,125	846	6,607
April	11,948	14,235	489	5,464	902	4,651
May	14,537	15,791	2,288	5,290	1,219	4,645
June	14,528	14,624	1,766	5,568	1,191	4,394
July	17,745	16,704	218	5,850	3,760	4,432
Aug	17,998	16,646	1,011	5,916	3,578	5,002
Sept	16,893	19,607	2,145	6,459	4,897	5,314
Oct	22,086	23,988	7,896	7,138	10,708	6,452
Nov	20,170	19,729	5,557	7,027	4,315	5,982
Dec	19,943	17,190	1,832	9,247	2,464	5,272
Total	195.674	183,415	25,380	73,523	35,582	61,708

BAUXITE SHIPPED FROM MINES

Year	Alabama and Georgia Long tons	Alabama and Georgia Value f.o.b. mine	Arkansas Long tons	Arkansas Value f.o.b. mine	Total Long tons	Total Value f.o.b. mine
1932	6,570	$40,471	89,779	$507,697	96,349	$548,168
1933	11,997	69,541	142,179	853,718	154,176	923,259
1934	12,074	71,991	145,764	1,057,062	157,838	1,129,053
1935	14,121	91,293	219,791	1,465,302	233,912	1,556,595
1936[1]	17,000	131,000	352,000	2,064,000	369,000	2,195,000

[1] Shipments and values for 1936 are preliminary and subject to revision.

PRODUCTION OF ACIDS

(All figures represent production for sale unless specified as "Made and consumed.")

	1935	1933	1929
Acids, total value	$72,687,052	$55,486,741	$98,619,871
Acetic (basis 100 percent):[1]			
Number of establishments	13	18	17
Pounds	98,697,347	65,150,478	66,364,066
Value	$9,945,243	$4,302,881	$6,890,411
Boric (boracic):			
Number of establishments	3	6	7
Pounds	28,506,000	21,612,634	26,055,132
Value	$1,237,555	$844,564	$1,541,360
Carbonic (carbon dioxide), liquid and solid:			
Number of establishments	60	50	54
Pounds	[2] 86,986,431	[3] 117,382,256	136,930,311
Value	$4,011,956	$4,466,461	$6,931,735
Chromic:			
Number of establishments	4	7	8
Pounds	6,724,304	4,969,047	4,211,605
Value	$887,842	$537,378	$710,272

PRODUCTION OF ACIDS—CONTINUED

Citric:			
Number of establishments	4	5	5
Pounds[3]	10,493,068	5,695,793	10,755,798
Value	$2,768,377	$1,795,382	$4,832,984
Hydrochloric:			
Number of establishments	32	36	33
Total production (basis 100 percent), tons	87,090	62,628	81,307
Made and consumed in same establishments, tons	32,201	17,733	18,701
For sale: Tons	54,889	44,895	62,606
For sale: Value	$3,048,159	$2,386,790	$3,195,415
From salt:			
Number of establishments	19		
Tons	47,098		
Value	$2,656,028		
From chlorine:			
Number of establishments	5		
Tons	3,229	([4])	([4])
Value	$203,398		
Byproduct and other:			
Number of establishments	8		
Tons	4,562		
Value	$188,733		
Hydrofluoric (basis 100 percent):			
Number of establishments	5	4	....
Pounds	2,972,161	[5] 2,037,787	([4])
Value	$468,178	$320,634	....
Mixed (sulphuric-nitric):			
Number of establishments	18	17	36
Tons	46,074	41,962	63,721
Value	$2,105,231	$1,883,320	$4,214,433
Nitric:			
Number of establishments	28	34	48
Total production (basis 100 percent), tons	122,596	100,414	143,454
Made and consumed in same establishments, tons	98,093	67,575	110,493
For sale: Tons	24,503	32,839	32,961
For sale: Value	$2,142,817	$2,969,013	$3,494,577
Oleic:			
Number of establishments	11		13
Pounds	43,753,984	([6])	56,947,401
Value	$3,272,536	([6])	$5,374,587
Oxalic:			
Number of establishments	4	4	....
Pounds	8,883,521	9,223,062	([4])
Value	$945,215	$903,254	....
Phosphoric:			
Number of establishments	12	13	9
Pounds	[7] 44,917,991	[7] 24,652,505	34,673,982
Value	$1,335,354	$891,563	$2,073,066
Pyrogallic:			
Number of establishments	3	3	....
Pounds	86,516	72,553	([4])
Value	$115,802	$100,414	....
Stearic:			
Number of establishments	11	....	12
Pounds	27,426,289	([6])	39,153,726
Value	$2,776,396	([6])	$5,488,320
Sulphuric:[3]			
Number of establishments	126	112	170
Total production (basis 50° Baume), tons	6,462,212	([9])	8,491,114
Made and consumed in same establishments, tons	1,991,743	([9])	2,674,949
For sale: Tons	4,470,469	3,847,889	5,816,165
For sale: Value	$31,907,806	$26,482,063	$45,573,245
Production, by process:			
Contact:			
Number of establishments	63	([9])	42
Total production, tons	3,046,833	([9])	3,076,240
Made and consumed in same establishments, tons	743,135		
For sale: Tons	2,303,698	([9])	([4])
For sale: Value	$18,054,528		
Chamber:			
Number of establishments	71	([9])	141
Total production, tons	3,415,379	([9])	5,414,874
Made and consumed in same establishments, tons	1,248,608		
For sale: Tons	2,166,771	([9])	([4])
For sale: Value	$13,853,278		
Tannic:			
Number of establishments	6	5	4
Pounds	[8] 724,552	682,462	1,449,375
Value	$304,728	$236,125	$503,567
Tartaric:			
Number of establishments	4	5	4
Pounds	6,887,101	6,798,855	4,906,479
Value	$1,609,027	$1,492,871	$2,059,680
Hydrocyanic:			
Number of establishments	5	....	....
Pounds	[5] 1,905,027	....	....
Value	$954,219	$5,874,028	$5,736,219
Other acids, value	[10] $2,850,611		

[1] Includes synthetic acid and natural dilute and glacial acids.
[2] Includes, for 1935, approximately 25,285,000 pounds of carbon dioxide piped to plants making "dry ice"; for 1933, approximately 64,500,000 pounds. No comparable data available for 1929.
[3] For 1935, basis 100 percent; for earlier years, not reported according to strength.
[4] No data.
[5] Revised.
[6] No figures for 1933, strictly comparable with those for other years, are available.
[7] Basis 50 percent H_3PO_4.
[8] Data for establishments classified in the Lead Smelting and Refining and Copper Smelting and Refining industries are included in the figures for 1935 and 1929 but not in those for 1933.
[9] Data incomplete; see footnote 8.
[10] Includes, in order of importance, value of acetic anhydride, formic, and molybdic acids, etc.

Canadian Chemical Output Gained Last Year

CANADIAN chemical production is estimated to have increased from 5 to 25 per cent in 1936 compared with 1935 on the basis of output recorded in the Province of Ontario. All lines except artificial leather shared in the upward movement, according to a report to the Department of Commerce.

In November, 1936, the industry was employing 7 per cent more workers than in the same month of the preceding year. Ontario's increased chemical output was due in large part to better export demand for paper and pulp, greater activity in mining and metallurgical industries, augmented business in textile, rubber and automotive fields, and better prices for agricultural products which enabled farmers to buy more fertilizers.

Paint sales in Ontario increased about 15 per cent in 1936 due to more repair and new construction work than during the preceding year. Sales of lacquers, pigments and enamels were also up but not to the same degree. Smaller quantities of these products were consumed by the automobile industry owing to the reduced output of 1935. In this field the trend has been to use less paints and varnishes of the nitro-cellulose lacquers and more varnishes with synthetic resin basis.

Ontario's soap and sanitary chemical manufacturers are reported to have had a good year. One Toronto soap company spent $1,000,000 in expanding its facilities and another, specializing in toilet soaps, has announced a $200,000 extension. Export business in these lines was about the same as in 1935.

Production of artificial leather declined somewhat due to use of all steel bodies in the motor car industry and to the prevailing price of leather.

Production of Sulphur Dioxide

	1935	1933	1931
Number of establishments	[1] 5	5	4
Produced for sale:			
Pounds	24,628,183	19,560,000	16,104,534
Value	$1,170,401	$968,000	$839,021

[1] New Jersey, two establishments; California, Virginia, and Wisconsin, one each.

Production of Sodium Sulphide

Year	Tons (2,000 lbs.)	Value
1935	[1] 24,757	$1,362,698
1933	[2] 30,732	1,354,000
1931	[2] 23,268	1,032,811
1929	[2] 33,032	1,406,606

[1] Basis 60 to 62 per cent.
[2] All strengths; not comparable with 1935.

Production of Copper Sulphate

(No comparable figures for 1933)

	1935	1931
Copper Sulphate:		
Number of establishments	14	13
Pounds	55,955,439	60,981,335
Value	$1,892,549	$2,183,522

Chemical Engineering NEWS

Rounded Program for TAPPI Annual Meeting

THE Technical Association of the Pulp and Paper Industry will hold its annual meeting at the Waldorf-Astoria Hotel, New York on February 22-25. At the opening session on February 22, the report of the secretary, the president's address, and reports of special committees will be submitted. In the afternoon, papers will be read on subjects bearing on production and plant management and also a symposium on paper fillers.

The program for February 23 calls for papers on acid pulping and on paper coating for the morning sessions and a printing symposium in the afternoon. The session on the following morning with addresses on paper and pulp testing with a general meeting at noon at which the report of the nominating committee will be read and officers elected for the ensuing year. This will be followed by the annual luncheon with the presentation of TAPPI Medal to C. J. West of the Institute of Paper Chemistry.

The final day of the meeting will be given over to the reading of papers on paper manufacture, alkaline pulping, and a symposium on mill water supply.

Chlorine Institute Holds Annual Meeting

ON January 21, The Chlorine Institute, Inc., held its annual meeting at the Chemists' Club, New York. Directors elected for two-year terms were: N. E. Bartlett, Pennsylvania Salt Mfg. Co.; Thomas Coyle, E. I. du Pont de Nemours & Co., Inc.; John A. Kienle, Mathieson Alkali Works, Inc.; Louis Neuberg, Westvaco Chlorine Products Corp.; and Eli Winkler, Columbia Alkali Corp. The hold-over directors are: J. F. C. Hagens, Great Western Electro-Chemical Co.; H. M. Hooker, Hooker Electrochemical Co.; S. W. Jacobs, Niagara Alkali Co.; and Eben C. Speiden, Innis, Speiden & Co.

The annual meeting was addressed by William W. Hurlbut of the Department of Water and Power, Los Angeles, Elon H. Hooker, president of Hooker Electrochemical Co., E. M. Allen, president of Mathieson Alkali Works, Inc., and by S. W. Jacobs, vice-president, Niagara Alkali Co. After the annual meeting the directors session was held at which the following officers were elected: president, S. W. Jacobs; Vice-president Eben C. Speiden; and secretary-treasurer, Robert T. Baldwin.

National Safety Council Sponsors Contest

ANNOUNCEMENT has been made of the National Safety Council, Inc., having an average monthly exposure of 6,000 man-hours or more actually engaged in manufacturing products is being sponsored by the Council. The contest which is to cover the period from January 1 to June 30, provides for three general divisions of manufacturing industries and a trophy will be awarded to the winner or winners at the twenty-sixth National Safety Congress. The winner in each group shall be the unit having the lowest frequency rate—number of disabling injuries per 1,000,000 hours worked—at the conclusion of the contest period.

Dr. H. N. McCoy to Receive Willard Gibb Medal

ANNOUNCEMENT has been made by the American Chemical Society that the Willard Gibbs Medal for 1937, one of the highest scientific honors in the United States, has been awarded to Dr. Herbert Newby McCoy of Chicago, internationally known for his achievements in radioactivity and in many other fields of chemical science, it was announced yesterday by the American Chemical Society. The award is given by the Chicago section of the society.

Dr. McCoy, vice president and director of research of the Lindsay Light and Chemical Company of Chicago, was cited "as a pioneer in a greater number of fundamental discoveries than any but three or four living American chemists." He had been a member for sixteen years of the faculty of the University of Chicago. He and Dr. William H. Ross, now of the United States Bureau of Soils, were the first to recognize clearly that isotopes, forms of an element differing only in atomic weight, are chemically inseparable substances.

Dr. McCoy will receive the medal at a dinner of the Chicago section on May 21.

Two Engineers Join Staff Of Soybean Laboratory

IT is announced that Wallace B. Van Arsdel and Dr. George H. Brother have been appointed to head the Meal and Development Sections, respectively, of the Regional Soybean Industrial Products Laboratory, which has been established at Urbana, Illinois, by the Bureau of Chemistry and Soils of the U. S. Department of Agriculture, under the provisions of the Bankhead-Jones Act of 1935.

Mr. Van Arsdel received his Chemical Engineering Degree from the Purdue University. He has been engaged in research and development work for The Brown Co. of Berlin, N. H., since August, 1914. His new duties will be to keep in touch with the soybean industry as a whole and to direct development and pilot plant work.

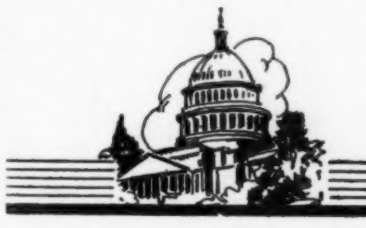
Dr. Brother received his B.S. in chemistry from the University of Nebraska and his Ph.D. from the University of Toronto. About ten years ago he was responsible for the development of a new casein plastic, and has worked for several industrial concerns. He is the author of the chapter on "Casein Plastics" in the volume "Casein and Its Industrial Applications," of the Sutermeister ACS monograph series.

Dr. Brother's duties as head of the Meal Section of the regional Soybean Industrial Products Laboratory will be to study the industrial utilization of soybean meal in the manufacture of adhesives, plastics, synthetic fibers, etc. This will involve a thorough fundamental study of the proteins of soybean meal, as well as their application for industrial purposes.

Jacques S. Negru Dead

Jacques S. Negru, managing editor of *Chem. & Met.* 1919-23 and subsequently with International Nickel Co., died in Santa Monica, Calif., on Dec. 13, 1936. He had retired from active work for the past few years.

NEWS FROM WASHINGTON



Washington News Bureau
McGraw-Hill Publishing Co.
Paul Wooton, Chief

NEW DEAL activities of Washington will continue along the conventional lines of the past four years. The first three enactments of this Congress confirm this conclusion, if any confirmation was needed. They provided for an extension of munitions-control authority, for the continuation of the Treasury stabilization fund and the President's right to vary the gold value of the dollar, and the extension of R.F.C. Other international fiscal matters will continue under the personal direction of the President, as chief planner.

Budget balance, gracefully indicated by the President's message, is nowhere near as close as casual reading of that document would indicate. The Ohio and Mississippi floods provide a splendid excuse for continued large relief expenditure, which would have been made anyhow on some other ground, if Nature had not provided this one. But fortunately for the taxpayer, the unbalance does not seem to be prospectively as large for the next fiscal year as last. However, reduction of deficits has really not been accomplished by any economy measures, rather by increasing taxation. And that's small comfort for those who wishfully think, but wrongly, of tax reductions. There will be none, save possibly one or two nuisance taxes that cost more to collect than Treasury income justifies.

Strike Issues

Chemical executives have as much concern with the problems with which General Motors officials are struggling as do automotive leaders. Probably this case will not finally or fundamentally settle the question of rights to "trespass" as a part of a "sit-down" strike. But as this is written there seems to be no possibility of serious study of the other three questions at issue until this first one shall have been at least partially cleared. The other three questions, fundamental to *all* manufacturing industry, are:

1. How large a percentage of employees is required to determine the rights of a union to negotiate? In the motor industry a minority admittedly demands the right of sole negotiation for non-members as well as members of their unit.

2. Establishment of the closed shop. In the motor industry this would be but a step toward complete unionization of great sections of industry. Labor executives are hopeful one way and management leaders the other. Perhaps no other single case in labor history has the important precedent-making significance of this one.

3. The principle of seniority for employees is at stake. Operating executives generally argue that this destroys the effectiveness of management and that it would increase manufacturing costs generally by substantial percentages. Acceptance of this principle is likely to be as bitterly contested as is the closed-shop issue. Even a partial victory for labor on this point would be precedent making.

Whatever the outcome of the General Motors controversy and the like battle scheduled for March in the steel industry and talked about for late Spring or Summer in chemicals, no one can effectively refute the forecast that the wage factor in costs of goods is likely to be higher.

Tariff Deals

Bilateral trade agreements will be negotiated by the State Department under Presidential supervision for another three years. Congress, although hearing certain criticisms which it regards as valid, will not clip Secretary Hull's peace wings in this case. But the Secretary has promised a new negotiating procedure which chemical executives will cordially welcome.

It is formally announced that negotiations with Equador are contemplated. Later a definite list of the commodities under discussion will be promulgated by the Department. Thus the secrecy factor as to the scope of negotiations is largely eliminated. And the Department promises this quasi-public program of action in all other cases, as well as in this relatively unimportant Equador negotiation.

The State Department has even stopped denying that a trade arrangement with Great Britain is in the making. Runciman, chief of the powerful British Board of Trade, did not even bother to go to Canada, although that was named as his first objective. Washington, therefore, understands that the transparent veil of secrecy around these plans is no longer even an official fiction.

Vigorous, and probably wholly ineffective, protests of the dairy industry against further cuts in tariff on farm products are noted. But it is notable also that Congress listens more carefully to State Department requests in this matter than to the usually powerful milk-man's lobby. It may be, however, that the Administration will decide to send all completed agreements to the Senate for formal approval. This would not concede that these arrangements are treaties, but would preclude court action undertaking to prove them illegal since not ratified as the Constitution requires for most international agreements.

Neutrality

Preventing wars by Presidential dicta and Congressional action never seemed very convincing to Washington realists. Equally unpromising have been most of the proposed forms of legislation restricting munitions and raw materials which become in effect munitions during time of war, cotton, corn, copper, and scores of others, for example. Change even in the official attitude regarding this situation seems imminent.

Probably the visit of Runciman made more impression on official minds in this regard than any amount of industrial harangue could have. This distinguished Briton made it clear that his nation wanted to count on American support in the form of supplies in the event that his country was drawn into a conflict. Officials of Washington could not deny the reasonableness of such a hope, nor escape the conclusion that such aid was likely to be demanded on the part of Congress by the American people in the unfortunate event of serious European conflicts.

Legislative planners are again struggling with the question as to how to permit such supply of goods as we would like to continue, even during periods of warfare, for our British cousins, without danger of having this country embroiled in any scrap. No one can even guess in February what the answer may be by the adjournment of Congress in May or June. But at the moment it looks as though all the sweeping prohibitions of the sort that Nye-led pacifists had wanted will not be forced through the Congress.

More Rules

Washington continues to practice more valiantly than ever the game of "Verboten." Dozens of these regulations newly promulgated concern chemical executives. As one observer in Washington said, the average company now needs a man who does noth-

ing but read new Washington orders. Fortunately, Uncle Sam has recently provided the "Official Register," in which most such regulations are published promptly and in full text to guide a firm's lawyers. Thus the Archives Bureau, publishing agent, not only keeps historical files, but currently makes history five days a week.

Spray residue rules continue for this season the same as last. The tolerance of lead on fruits and vegetables will be 0.018 grain per pound and the limits on arsenic (as As_2O_3) and fluorine continue 0.01 grain per pound of foodstuff.

Far more sweeping regulation of foods and drugs is expected if the new law is enacted by this Congress, as most proponents and the majority of opponents, expect. Most important in this area of controversy is the Bill S.5, which is Senator Copeland's revised idea of placing cosmetics and medical devices along with foods and drugs under the supervision of the Food and Drug Administration, including supervision of advertising as well as labels. The battle remains as last year, whether this advertising supervision ought not to go to the Federal Trade Commission. Thus early in the session it does not appear that F.T.C., powerful lobbyist though it is, can garner this basket of new administrative plums.

Power Battle

Now the fight over power regulation by Uncle Sam is going on between two factions of officials. The Crack-Down Division is led by David Lilienthal, crusading director of T.V.A., who seeks to destroy, not to regulate. The more conservative Regulatory Division is headed by the other T.V.A. director, Chairman A. E. Morgan, who chooses to yard-stick utilities into reform progressively, rather than to attempt immediate general extermination.

T.V.A. has, therefore, become a battle ground in which two fundamental issues, never harmonious, are now embattled, much to the President's embarrassment. Just now (early February) no one knows what sort of a clever out the dexterous planners will find in order that neither of the two Presidential objectives suffers. These are:

(1) A great social experiment in the backward Tennessee Valley, Morgan inspired, Morgan led, probably as close to the President's heart as any utility power efforts.

(2) Cheaper power, holding-company regulation or elimination, a yard-stick effort, which make up a second, but probably almost equal, desire of the Chief Executive.

Regardless of the settlement of these non-conflicting but contesting objectives, chemical industry has a great concern. It will want to know how power rates are going to be fixed for the benefit of electricity-using industry, first at Bonneville, then at other government-owned enterprises. A special committee is advising the President on this problem this month. But Congress has the last say-so. Ultimately, some bookkeeping device will develop, permitting allocation of much of the capital cost at hydro properties to other than power development. Thus power will be made cheap and industrial buyers may shortly stand in line at Uncle Sam's power-plum pantry for their share.

Water, a Resource

A more firm grip on water resources development may be a major outcome of flood control. This will mean many things to chemical industry. Perhaps most pressing on executives will be the consideration of limits on stream pollution.

Two sets of bills establishing federal regulation are in Congressional hoppers already. Senator Lonergan, of Connecticut, leads the group that wishes to have a new virile agency effective in this field. More conservative, probably welcomed by most process industry, are the other bills, which provide a division of water pollution control for the Public Health Service. The issue is not fundamentally different than in the last Congress, when final enactment failed simply because these two factions could not reconcile their differences as to who should boss the job of river clean-up. They will probably get together this session, and plant effluents will then be policied.

Haunted by the specter of a 14,000,000 bale cotton crop, a record wheat crop and confronted with a yen to plant tobacco even in flower pots and window boxes, agricultural officials believe a return to rigid control is necessary if an acute surplus situation is avoided in 1937. They recognize that under the stimulus of the high prices that prevailed in 1936 farmers will not be influenced by anything in the soil conservation and domestic allotment act to give up basic crops for soil building crops. If normal weather conditions prevail in 1937 it is feared that the gain that has been made in the direction of a balanced agriculture will be lost.

Just how New Deal lawyers are going to get around the decision of the Supreme Court in the AAA case has not been revealed but there are indications that they have worked out a way in which they have confidence. Approach to the problem by the amendment route is not favored as it is realized that opponents probably could block ratification in thirteen states. More than that no one has been able to work out an amendment broad enough to allow federal control over local production that might not apply also to such rights as free speech and assembly.

Henry A. Wallace, the Secretary of Agriculture, has expressed the opinion publically that the phase of the present law providing for control through state AAA's will not work. Formal request for the repeal of that feature of the law is expected. The states never have taken it seriously. No single state has taken a step toward creating such machinery.

While given pause by the rising clamor against high living costs there is every reason to believe that the administration will make every effort to regain control over basic agricultural products. The New Deal is just as determined as ever "to prevent 9,000,000 farmers from cutting each others' throats."

Transactions of Chemical Congress in Print

THE Transactions of the International Chemical Engineering Congress, held in London last June, will be published as early as possible this year, and have been offered at the pre-publication price of £10.

The publishers, Messrs. Percy Lund Humphries & Co., Ltd., 12, Bedford Square, W.C.1, London, England, will send, on application, full prospectus of the 121 papers which, with General Reports on Sections, and discussions, and an account of the Congress, occupy Vols. I to IV. Vol. V contains author and subject index. Most of the papers are in English. All are provided with French and German summaries, and comprehensive bibliographies.

New Pulp Mill Will Use Southern Yellow Pine

NEWS dispatches from Dallas, Texas, state that as a result of conferences between industrialists in banking, petroleum, sulphur, natural gas, and timberlands trades, it has been decided to build the first newsprint mill in the south which will make use of southern yellow pine as a basis for its pulp production. Engineers are reported to be making surveys for a site which will be located in the eastern part of Texas. Plans call for a mill with a daily capacity of 150 tons of newsprint to be built at a cost of $5,000,000. The company will be incorporated as the Southland Paper Mills, Inc.

Napthalene Carbon Black In Germany

GERMAN efforts during the past two years to produce a carbon black from naphthalene which would be equal in quality and competitive in price with American gas blacks are reported to have met with success, according to reports from the American Consulate, Frankfort-on-Main.

The German product which is based upon naphthalene as a raw material, and manufactured by the Wagelin process has been in commercial production for some time and is said to be rapidly displacing American carbon blacks which formerly supplied the large bulk of Germany's domestic demand for high grade black pigments.

To insure a market for domestic blacks a decree was issued by the Government last July which required rubber tire manufacturing and other consuming industries to admix at least 20 per cent of the new product with imported gas blacks for all purposes and restricts exports of naphthalene.

A firm known as Russwerke Dortmund, capitalized at 4,000,000 marks, is reported to be establishing a new plant in the Ruhr District for the manufacture of naphthalene carbon black by the Scheideanstalt-Wegelin process. The new firm is controlled in equal parts by the parent company of the Wegelin A. G. and a group of rubber tire concerns.

Canadian Chemists Will Meet in Vancouver

THE annual convention this year of the Canadian Chemical Association and the Canadian Institute of Chemistry will be held in Vancouver on June 17-19.

This convention has never been held in the West and the Council felt that the West should be favored with it in 1937 so as to promote better acquaintance between the chemists of the West and the East, and incidentally to give the eastern chemists an opportunity of a trip through the Canadian West.

Elaborate plans are being made by the secretary, Dr. Elworthy, for a special train to leave Toronto and Montreal on Friday evening, June 11, spending a few hours in Winnipeg Sunday morning, then on to Kimberly where the Sullivan Mine, the greatest silver-bar mine in the world, will be visited. The following day the Consolidated Mining and Smelting Co.'s plant at Trail will be visited and the special train will arrive in Vancouver on Wednesday evening.

The expense of this trip is estimated at two hundred dollars covering everything, that is, transportation, meals, and hotel expenses at Vancouver and this figure should be sufficiently low to justify many chemists to arrange to make this trip. It is also hoped that many of the chemists will take this opportunity of taking their wives with them as it will make a wonderful vacation trip, occupying two weeks from Toronto, Montreal or New York.

Past conventions of the chemical association have been very interesting and extremely worth while to Canadian chemists and the conventions have always been favored with the attendance of quite a number from the States, and chemists from the states are cordially invited to meet with the Canadian chemists at Toronto or Montreal, to accompany them on the special train to the convention.

It is also planned that Victoria will be visited after the convention. Dr. R. H. Clarke of the Department of Chemistry of the University of B. C. has lined up an excellent program of papers, special entertainment features for the ladies and has guaranteed true western hospitality to all the visiting easterners.

More complete information as to the program will be released later and in the meantime, those seeking more detailed information as to itinerary and cost, should address their inquiries to Dr. R. I. Elworthy, Secretary, Canadian Chemical Association, 366 Adelaide Street West, Toronto, Ontario.

Chemical Salesmen Nominate Officers for 1937

NOMINATIONS for officers for the coming year have been announced by the committee of the Salesmen's Association of the American Chemical Industry and the executive committee has named March 1 as the date for holding the election.

Names presented by the nominating committee are: president, Charles Lichtenberg, Commercial Solvents Corp.; vice-president, Charles E. Kelly, Hagerty Brothers & Co.; secretary, De Witt Thompson, Mathieson Alkali Works; treasurer, J. M. Wafer, Industrial Chemical Sales Co.; and for three-years as members of the executive committee, A. A. Wasserscheid, Mallinckrodt Chemical Works, and W. D. Merrill, Joseph Turner & Co.

Additional Fellowships Given by du Pont

IT has been decided by E. I. du Pont de Nemours & Co. to increase the number of fellowships it awards annually to six post-doctorate fellowships and eighteen post-graduate fellowships for the academic year 1937-38. This action has been taken because of the success of the plan in encouraging and developing organic chemical research. These fellowships, which will be located at eighteen leading universities and colleges, are maintained to encourage more promising students in research work in the field of chemistry. Last year, the company awarded four post-doctorate fellowships and twelve post-graduate fellowships.

Since the company first began these awards in the academic year 1918-19, there have been granted 350 fellowships and 34 scholarships in 33 universities, and, in addition, a national fellowship was awarded at Johns Hopkins University for a period of four years.

Bausch & Lomb Open New Research Laboratory

AT a cost of approximately $40,000 and a 50 per cent increase in its staff of graduate chemical engineers and metallurgists, Bausch & Lomb Optical Co. has opened a new laboratory for applied research at its plant in Rochester, N. Y.

Guided by Frank P. Kolb, chief chemist, and Theodore J. Zak, assistant chemist, company officials saw the conversion of nearly 9,000 square feet of space on the fifth floors of two buildings facing the Genesee River into a series of laboratory units devoted to research in the fields of metallurgy, experimental electro-plating, spectroscopy, photomicrography, and physical testing. A well-stocked library and a consulting room add to the facilities of the research staff.

Cottrell to Receive Washington Award

THE Washington Award for 1937 has been bestowed on Dr. Frederick G. Cottrell of Washington, D. C. The award is made jointly by the Western Society of Engineers, A.S.M.E., A.S.C.E., A.I.E.E. and A.I.M.M.E. in recognition of "accomplishments which pre-eminently promote the happiness, comfort and well-being of humanity."

Dr. Cottrell is widely known for his development of the electrical precipitation process for removing solids from gases, for his work in nitrogen fixation and for research in petroleum technology. He is president of Research Associates, Inc., director of the Fixed Nitrogen Laboratory, U. S. Department of Agriculture, and a former director of the U. S. Bureau of Mines. He is the fourteenth noted American engineer to receive this award since it was founded in 1916 by John Watson Alvord of Chicago.

German Chemical Companies Development Programs

FROM OUR GERMAN CORRESPONDENT

HOW THE millions necessary to construct new plants for synthetic materials are to be raised is indicated in the announcement that large German industrial concerns, especially west German mining interests, are planning to issue loans of their own, probably 5 per cent bonds floated slightly below par and resembling the Reichsbank loans and other recently converted bonds. In 1936 "new" investments in Germany totaled about 6 billion RM (12 including replacements), of which about 2 billion came from industrial sources while the larger part represented government and public investment. With the huge capital required and the high costs of synthetic products, which in addition must overcome consumers' prejudices against "substitutes," so far plants have been induced to expand synthetic production capacity mainly with the government providing the capital or guaranteeing long-term prices.

In the case of the new staple fiber, or "cellulose wool," industry, aside from the two pioneering manufacturers, I.G. Farben ("Vistra") and Vereinigte Glanzstoff ("Stapelfaser"), five "regional" companies were formed on a cooperative basis, under government pressure, by local cotton spinners in 1935. Although the ambitious program has not been completely realized, production of staple fiber rose from 1 million kgs. in 1932, to 7 million in 1934, to 15 million in 1935, to 40 million in 1936. By the end of 1937 it is hoped the yearly production will reach 70 million kgs., which would fulfill one-sixth of the total German textile raw material requirements. Recently the Saechsische Zellwolle, A.G., Plauen began production, estimated at over 20,000 kgs. per day. The Spinnfaser A.G., Kassel, now producing 17,000 metric tons of staple fiber annually, is planning a considerable extension of its plant. Another cellulose wool plant, the Rheinische Zellwolle A.G., has just been founded in Cologne and is being backed by several banks as well as the Thuringian Zellwolle A.G.

The financing of synthetic motor fuel plants has presented similar problems. Because of lower production costs and surer sales and better developed technical processes, manufacturers at first concentrated their efforts in producing lighter fuels, neglecting less profitable heavier oils. Government pressure, which is as effective as state ownership with industry so highly integrated and mobilized, has effected an equalization in the meantime. According to a statement made in January in the opening number of the new publication *"Der Vierjahresplan,"* (The Four Year Plan), within 15 months Germany will be manufacturing all her own light motor fuel. The annual report of the Gutehoffnungshuette, A.G., Oberhausen, states that their experimental operation with the Fischer-Tropsch synthesis (which is constantly gaining in importance) has been successfully concluded and has resulted in contracts to build several complete synthetic motor fuel plants in Germany and abroad. City gas plants are also being mobilized in the synthetic fuel campaign. At a recent meeting in Frankfurt leading chemists and gas representatives formed a "commission to promote low-temperature coking to obtain motor fuel in gas works" and has drawn up a general plan to unify the synthetic production of the larger gas works in Germany.

A recent automobile census showed that 35 per cent of all motor trucks in Germany over two tons operate with diesel engines. Only 798 trucks were using gas generators and 506 tanks containing various gases, and only 16 steam engines. A truck powered with anthracite coal, generating gas, has been operated during the past year by the Gewerkschaft Heinrich in Essen. The company reports that it requires only 3 RM coal per 100 kilometers as against 20 RM with liquid fuel. With a trailer and a load of 10 tons the truck runs between 30 and 35 miles per hour.

The Continental Rubber Works, Hannover, spent 7 million RM in 1936 for plant extensions and plan further expenditures of 12.5 million in 1937. The plans include enlarging the second-hand rubber regeneration plant, erecting a new synthetic rubber plant, and participating in building a future plant to make rubber from gas soot.

To develop the raw materials of the province of Thuringia, at the turn of the year the Thueringische Rohstoff A.G. was established with a capitalization of 1 million RM to survey and practically utilize the natural resources of Thuringia.

To relieve Germany's vulnerability due to lack of domestic metals the government raw material control offices have been given additional powers. To make more nickel, chrome and cobalt free, their use for non-technical purposes and plating has been forbidden and the use of substitute materials similar to Bakelite or the ampler metal aluminum has been encouraged. Rubber plants, on the other hand, are being required to keep a maximum reserve supply. A recent decree, of the control office for non-precious metals authorizes this body to regulate production in a given plant and to specify for what purposes the metals can be manufactured. Difficulties in securing some metals are causing concern. German firms have been paying the International Nickel Co. of Canada 55 cents per lb. for nickel as against 35 cents charged by the United States for this metal. At present a widespread movement is going on to change smaller coins, especially one mark pieces, from silver to nickel, which is believed by some to be an effort to build up a nickel reserve for war time purposes similar to Austria which secured enough nickel for armor plate and shells for the first two years of the War by calling in all nickel coins circulating in the Empire. It is reported that chrome and manganese deliveries are beginning from the mines purchased from Swedish interests a year ago in Turkey and on a Greek island in the Aegian sea. These mines have been developed in the meantime with German mining machinery in return for which the ore produced is to be shipped to Germany.

A newcomer on the Berlin stock exchange is the Wintershall A.G., Berlin and Kassel, the largest German potash concern, which has recently entered the coal mining, motor fuel and light metal production field. Its petroleum is partly refined by Deurag, in which Shell and Standard Oil have an interest. Recently an affiliate of the Wintershall concern commenced synthetic motor fuel production from lignite, using the Fischer-Tropsch synthesis.

The creation of a special division "Whaling," with government subsidy, under the top organization "Chemical Industries," evidences the increasing importance of this branch in supplying much needed fats with Germany actively entering the Arctic and Antarctic whaling field to save this 60 million RM annual import item. Forty per cent of Germany's margarine is made from whale oil. A mixture of a small amount of pepsin solution "Nigiton," now manufactured on a large scale in Berlin, makes it possible to keep margarine fresh for as long as five months. Recent trial shipments to China and South America after half a year had the same taste, ordor, and color as on the day the margarine was first made.

The MARKETS

LABOR and flood conditions during the past month worked against the progress of chemicals to a certain extent and were responsible for the deferring of contract deliveries to the soap, glass, and paint and varnish industries in the effected areas. Demand for chemical products, however, was fairly active and with the exceptions noted, deliveries were being made according to schedule. In some cases, productive operations were speeded up because of buying pressure. For instance, call for copper sulphate has been active for some time and stocks in sellers' possession have not been large enough to satisfy demand especially if inquiry for export is considered.

Prices for the most important chemicals are on a well established basis and do not fluctuate to any extent from month to month, the greater part of production going out against contract commitments. However, sulphate of ammonia was marked up at the beginning of the month and the metal salts are in a sensitive position because of the frequent changes in the different basic metals. The quotations for some chemicals are somewhat lower than they were in the latter part of last year because of lessened differentials according to quantities. The passage of the Robinson-Patman Bill is responsible for this situation and while many of the chemicals affected are holding at the same price levels as in the latter part of last year, there is in effect a reduction of prices since the small lot buyers are able to obtain stocks on more favorable terms.

Prices for vegetable oils, which rose sharply in the preceding month, lost a good part of the advance. The termination of the shipping strike eased the situation as far as imports of copra and coconut oil were concerned. Foreign oil markets were lower, flaxseed sold off and crude cottonseed oil sold at lower prices in producing centers.

Animal fats also were lowered with steadily mounting lard stocks affecting both fats and edible vegetable oils.

Total net sales and collections on accounts receivable showed continued improvement during December, 1936, for the group of manufacturers reporting in the monthly joint study of the National Association of Credit Men and the Bureau of Foreign and Domestic Commerce. Marked gains in sales and a higher rate of collections were recorded for each month of 1936 as compared with the same month in 1935 by this group of manufacturers.

The total net sales of 516 manufacturers throughout the country reporting in December, 1936 registered an increase of 35 per cent from December, 1935. Without adjustment for seasonal influences, December, 1936 sales registered an increase of approximately 9 per cent from November of last year.

Total sales increased in December, 1936 over the same month last year for all of the 15 industry groups shown in the report. The increases ranged from 19.5 per cent for petroleum products to about 50 per cent for forest products.

Among the industries for which increases in sales were reported were: paper and allied products, 27 per cent over December, 1935 and 13.8 per cent over November, 1936; chemicals and allied products, 43.1 per cent over December, 1935 and 2.5 per cent over November, 1936; paints and varnishes, 48.4 per cent over December, 1935 and 12.2 per cent over November, 1936; petroleum products, 19.5 per cent over December, 1935 and 3.5 per cent over November, 1936; leather and its products, 29.3 per cent over December, 1935 and 15.2 per cent over November, 1936; rubber products, 33.8 per cent over December, 1935 and 1.4 per cent over November, 1936.

A report from the U. S. Department of Agriculture states the most promising of the department's newest insecticide discoveries is phenothiazine, a compound of carbon, hydrogen, nitrogen, and sulphur that is easily prepared by combining diphenylamine and sulphur. After preliminary tests in the laboratory had shown that it killed the larvae of mosquitos and of the codling moth exposed to it, phenothiazine was taken out into the field for a limited trial. When it gave promise in these small-scale tests, it was put through a course of large-scale field tests. The results of these tests, though in the main highly encouraging in the Northwest, show the need for more study.

In the Northwest phenothiazine controls the codling moth much better than lead arsenate, for many years the apple grower's main standby, but now generally considered far short of the ideal insecticide. Chief advantages of phenothiazine are that it keeps down the number of stings made on fruit by the worms, and that the residue it leaves is less likely than lead or arsenic to injure human consumers of the treated food products. In the Midwest and East, field tests have given variable results.

The combined Chinese and Manchurian production of oilseeds in 1936 including soybeans, sesame seed, peanuts, cotton seed, rapeseed, and linseed, was considerably above that of 1935 but combined exports are not expected to increase in proportion with the increase in production, according to a radio to the Bureau of Agricultural Economics from its Shanghai office.

Although Manchuria may export more oilseeds and derivative oils in 1936-37 than last year, exports from China are likely to be reduced.

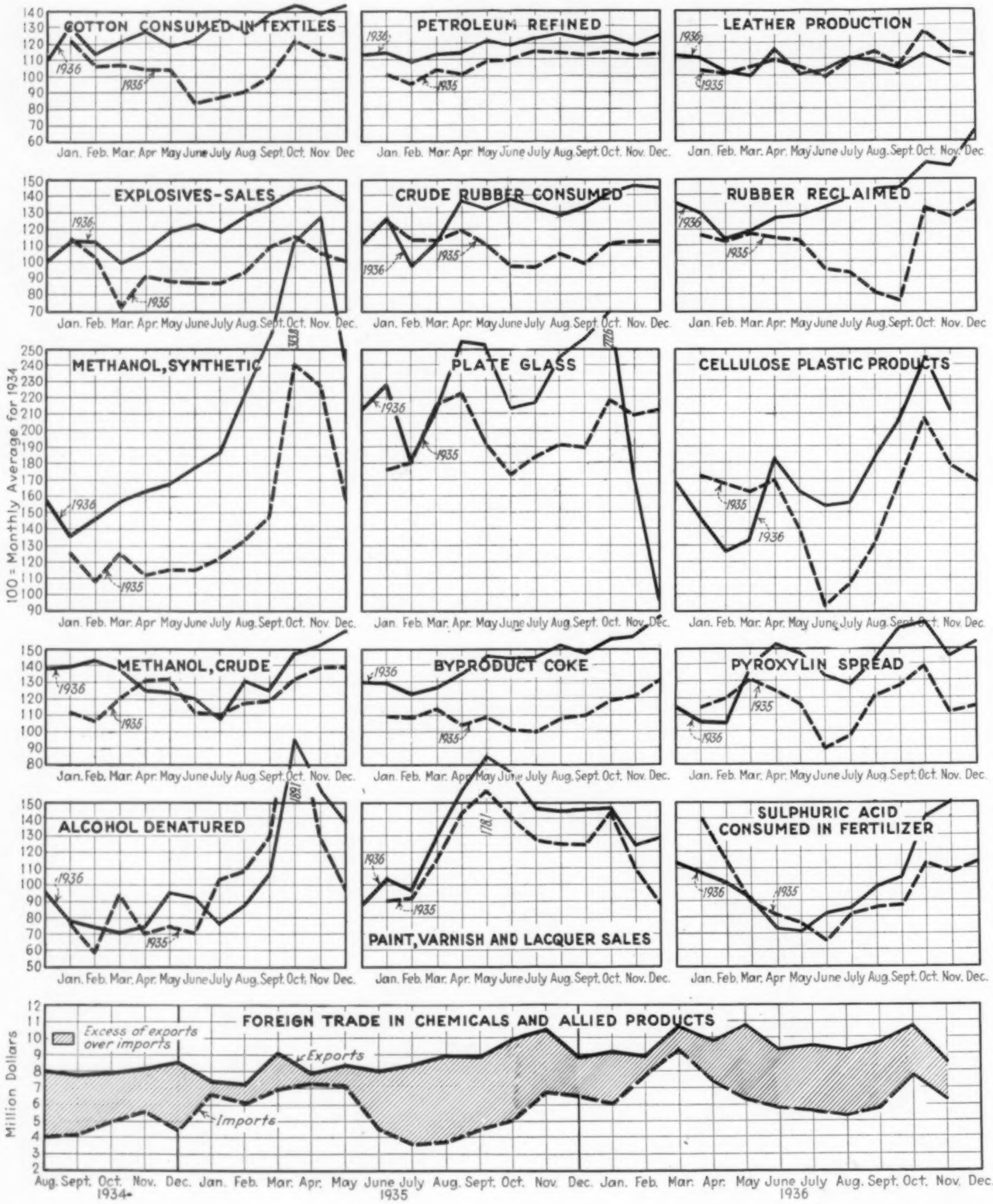
For China the report indicates an increase of 7 per cent in the sesamum crop, with 45 per cent in the cottonseed output, 15 per cent in peanuts, 15 per cent in soybeans, and 30 per cent in linseed. The rapeseed crop is reported as about the same as last year. It was reported, however, that total exports of Chinese oilseeds and derivative oils during 1936-37 are not expected to exceed those of 1935-36. Small increases may take place in the exports of cottonseed, peanuts, and derivative oils but decreases are indicated in exports of other seeds and oils.

Curtailed Chinese exports are anticipated as a result of unusually low carryover stocks, increased substitution of oilseeds for food crops in the districts where yields of late harvested crops were reduced by drought, and by uncertainty regarding the 1937 wheat crop.

The 1936 soybean crop of Manchuria is officially estimated at 4,602,000 short tons compared with 3,637,000 tons last year, according to the report. The total supply for the 1936-37 season (October-September) is placed at 4,657,000 tons, the October 1 carryover having amounted to 55,000 tons. Last year's total supply was estimated at 3,714,000 tons, with a carryover of 77,000 tons. It is expected that the 1936-37 exports of Manchurian soybeans and soybean oil will amount to 2,590,000 and 83,000 tons, respectively, as compared with 2,048,000 and 83,000 tons, respectively, in 1935-36.

The 1936 Manchurian hempseed crop is estimated at 37,000 short tons compared with 50,000 tons last year and the perilla seed crop at 155,000 tons compared with 200,000 tons last year. Production of cottonseed, sesame seed and peanuts is of minor importance but is reported as larger than last year.

TRENDS OF PRODUCTION AND CONSUMPTION



Current PRICES

The following prices refer to round lots in the New York market. Where it is the trade custom to sell f.o.b. works, quotations are given on that basis and are so designated. Prices are corrected to February 13

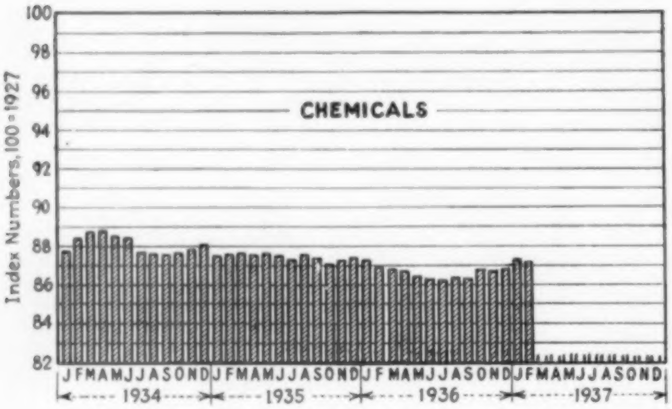
Industrial Chemicals

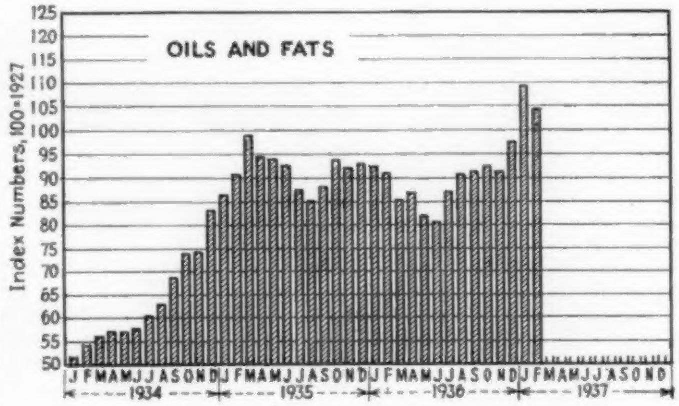
	Current Price	Last Month	Last Year
Acetone, drums, lb	$0.07 -$0.08	$0.07 -$0.08	$0.12-$0.12½
Acid, acetic, 28%, bbl., cwt	2.25 - 2.50	2.45 - 2.70	2.45 - 2.70
Glacial 99%, drums	8.43 - 8.68	8.43 - 8.68	8.43 - 8.68
U. S. P. reagent	10.52 -10.77	10.52 -10.77	10.52 -10.77
Borie, bbl., ton	105.00-115.00	105.00-115.00	105.00-115.00
Citric, kegs, lb	.25 - .28	.25 - .28	.28 - .31
Formic, bbl., ton	.11 - .11½	.11 - .11½	.11 - .11½
Gallic, tech., bbl., lb	.60 - .65	.60 - .65	.60 - .65
Hydrofluoric 30% carb., lb	.07 - .07½	.07 - .07½	.07 - .07½
Lactic, 44%, tech., light, bbl., lb	.06¼- .06½	.06¼- .06½	.11½- .12
Muriatic, 18°, tanks, cwt	1.00 - 1.10	1.00 - 1.10	1.00 - 1.10
Nitric, 36°, carboys, lb	.05 - .05½	.05 - .05½	.05 - .05½
Oleum, tanks, wks., ton	18.50 -20.00	18.50 -......	18.50 -20.00
Oxalic, crystals, bbl., lb	.10¾- .12	.10¾- .12	.11½- .12½
Phosphoric, tech., c'bys., lb	.09 - .10	.09 - .10	.09 - .10
Sulphuric, 60°, tanks, ton	11.00 -11.50	11.00 -11.50	11.00 -11.50
Sulphuric, 66°, tanks, ton	15.50 -......	15.50 -......	15.50 -......
Tannic, tech., bbl., lb	.20 - .30	.20 - .30	.23 - .35
Tartaric, powd., bbl., lb	.21½- .22½	.24 - .25	.24 - .25
Tungstic, bbl., lb	1.50 - 1.60	1.50 - 1.60	1.50 - 1.60
Alcohol, Amyl	......-......	......-......	......-......
From Pentane, tanks, lb	.123 -......	.123 -......	.15 -......
Alcohol, Butyl, tanks, lb	.08½-......	.08½-......	.11 -......
Alcohol, Ethyl, 190 p'f., bbl., gal	4.14 -......	4.14 -......	4.27½-......
Denatured, 190 proof			
No. 1 special, dr., gal wks	.32 -......	.32 -......	.33 -......
Alum, ammonia, lump. bbl.. lb	.03 - .04	.03 - .04	.03 - .04
Potash, lump, bbl., lb	.03 - .04	.03 - .04	.03 - .04
Aluminum sulphate, com bags cwt	1.35 - 1.50	1.35 - 1.50	1.35 - 1.50
Iron free, bg., cwt	2.00 - 2.25	2.00 - 2.25	1.90 - 2.00
Aqua ammonia, 26°, drums, lb	.02½- .03	.02½- .03	.02½- .03
tanks, lb	.02¼- .02½	.02¼- .02½	.02¼- .02½
Ammonia, anhydrous, cyl., lb	.15½- .16	.15½- .16	.15½- .16
tanks, lb	.04½-......	.04½-......	.04½-......
Ammonium carbonate, powd. tech., casks, lb	.08 - .12	.08 - .12	.08 - .12
Sulphate, wks., cwt	1.35 -......	1.25 -......	1.20 -......
Amylacetate tech., tanks, lb	.11 - .11½	.11 - .11½	.142-......
Antimony Oxide, bbl., lb	.14 - .14½	.14 - .14½	.14 - .14½
Arsenic, white, powd., bbl., lb	.03 - .03½	.03 - .03½	.03½- .04
Red, powd., kegs, lb	.15¼- .16	.15¼- .16	.15¼- .16
Barium carbonate, bbl., ton	56.50 -58.00	56.50 -58.00	56.50 -58.00
Chloride, bbl., ton	72.00 -74.00	72.00 -74.00	72.00 -74.00
Nitrate, cask, lb	.08½- .09	.08½- .09	.08½- .09
Blanc fixe, dry, bbl., lb	.03½- .04	.03½- .04	.03½- .04
Bleaching powder, f.o.b., wks., drums, cwt	2.00 - 2.10	2.00 - 2.10	2.00 - 2.10
Borax, gran., bags, ton	44.00 -49.00	44.00 -49.00	44.00 -49.00
Bromine, cs., lb	.36 - .38	.36 - .38	.36 - .38
Calcium acetate, bags	2.10 -......	2.10 -......	2.10 -......
Arsenate, dr., lb	.06¾- .07	.06 - .07	.06 - .07
Carbide drums, lb	.05 - .06	.05 - .06	.05 - .06
Chloride, fused, dr., del., ton	20.00 -33.00	20.00 -33.00	20.00 -33.00
flake, dr., del., ton	22.00 -35.00	22.00 -35.00	22.00 -35.00
Phosphate, bbl., lb	.07½- .08	.07½- .08	.07½- .08
Carbon bisulphide, drums, lb	.05½- .06	.05½- .06	.05½- .06
Tetrachloride drums, lb	.05¼- .08½	.05¼- .06	.05¼- .06
Chlorine, liquid, tanks, wks., lb	2.15 -......	2.15 -......	2.15 -......
Cylinders	.05½- .06	.05½- .06	.05½- .06
Cobalt oxide, cans, lb	1.41 - 1.51	1.41 - 1.51	1.39 - 1.45
Copperas, bgs., f.o.b., wks., ton	15.00 -16.00	15.00 -16.00	15.00 -16.00
Copper carbonate, bbl., lb	.11½- .16	.11½- .16	.11½- .16
Sulphate, bbl., cwt	4.85 - 5.10	4.70 - 5.00	3.85 - 4.00
Cream of tartar, bbl., lb	.15 - .15½	.15 - .15½	.16½- .17
Diethylene glycol, dr., lb	.16½- .20½	.16½- .20½	.16½- .20½
Epsom salt, dom., tech., bbl., cwt	1.80 - 2.00	1.80 - 2.00	2.10 - 2.15
Ethyl acetate, drums, lb	.07 -......	.07 -......	.08½-......
Formaldehyde, 40%, bbl., lb	.05¾- .06½	.05¾- .06½	.06 - .07
Furfural, dr., lb	.10 - .17½	.10 - .17½	.10 - .17½
Fusel oil, ref. drums, lb	.16 - .18	.16 - .18	.16 - .18
Glaubers salt, bags, cwt	.85 - 1.00	.85 - 1.00	1.00 - 1.10
Glycerine, c.p., drums, extra, lb	.29 -......	.24½-......	.14 - .14½
Lead:			
White, basic carbonate, dry casks, lb	.07½-......	.07½-......	.06½-......
White, basic sulphate, sck., lb	.06½-......	.06½-......	.06 -......
Red, dry, sck, lb	.085-......	.085-......	.07 -......
Lead acetate, white crys., bbl., lb	.11½- .12	.11½- .12	.10½- .11
Lead arsenate, powd., bbl., lb	.09½- .10	.09½- .10	.09 - .10
Lime, chem., bulk, ton	8.50 -......	8.50 -......	8.50 -......
Litharge, pwd., csk., lb	.075-......	.075-......	.06 -......
Lithophone, bags, lb	.04½- .04¾	.04½- .04¾	.04½- .05
Magnesium carb., tech., bags, lb	.06 - .06½	.06 - .06½	.06 - .06½
Methanol, 95%, tanks, gal	.33 -......	.33 -......	.33 -......
97%, tanks, gal	.34 -......	.34 -......	.34 -......
Synthetic, tanks, gal	.33 -......	.35½-......	.35½-......
Nickel salt, double, bbl., lb	.13 - .13½	.13 - .13½	.13 - .13½
Orange mineral, csk., lb	.11¾-......	.11¾-......	.10 -......
Phosphorus, red, cases, lb	.40 - .42	.40 - .42	.44 - .45
Yellow, cases, lb	.28 - .32	.28 - .32	.28 - .32
Potassium bichromate, casks, lb	.08¼- .09	.08¼- .09	.07¾- .08¼
Carbonate, 80-85%, calc. csk., lb	.07 - .07½	.07 - .07½	.07 - .07½
Chlorate, powd., lb	.08 - .08¾	.08 - .08¾	.08¾- .09
Hydroxide (c'stic potash) dr., lb	.07 - .07½	.07 - .07½	.06¼- .06½
Muriate, 80% bgs., ton	23.00 -......	23.00 -......	22.00 -......
Nitrate, bbl., lb	.05½- .06	.05½- .06	.05½- .06
Permanganate, drums, lb	.18½- .19	.18½- .19	.18½- .19
Prussiate, yellow, casks, lb	.16 - .17	.18 - .19	.18 - .19
Sal ammoniac, white, casks, lb	.04½- .05	.04½- .05	.04½- .05
Salsoda, bbl., cwt	1.00 - 1.05	1.00 - 1.05	1.00 - 1.05
Salt cake, bulk, ton	13.00 -15.00	13.00 -15.00	13.00 -15.00
Soda ash, light, 58%, bags, contract, cwt	1.23 -......	1.23 -......	1.23 -......
Dense, bags, cwt	1.25 -......	1.25 -......	1.25 -......
Soda, caustic, 76%, solid, drums, contract, cwt	2.60 - 3.00	2.60 - 3.00	2.60 - 3.00
Acetate, works, bbl., lb	.04½- .05	.04½- .05	.04¾- .05
Bicarbonate, bbl., cwt	1.75 - 2.00	1.75 - 2.00	1.85 - 2.00
Bichromate, casks, lb	.06¾- .07	.06¾- .07	.05¾- .06¾
Bisulphate, bulk, ton	15.00 -16.00	15.00 -16.00	15.00 -16.00
Bisulphite, bbl., lb	.03¼- .04	.03¼- .04	.03 - .04
Chlorate, kegs, lb	.06¼- .06½	.06¼- .06½	.06¼- .06½
Chloride, tech., ton	12.00 -14.75	12.00 -14.75	12.00 -14.75
Cyanide, cases, dom., lb	.15½- .16	.15½- .16	.15½- .16
Fluoride, bbl., lb	.07½- .08	.07½- .08	.07½- .08
Hyposulphite, bbl., cwt	2.40 - 2.50	2.40 - 2.50	2.40 - 2.50
Metasilicate, bbl., cwt	2.15 - 3.15	2.15 - 3.15	3.25 - 3.40
Nitrate, bags, cwt	1.375-......	1.375-......	1.275-......
Nitrite, casks, lb	.07½- .08	.07½- .08	.07½- .08
Phosphate, dibasic, bbl., lb	.022- .023	.022- .023	.022- .024
Prussiate, yel. drums, lb	.10 - .11	.10 - .11	.11½- .12
Silicate (40° dr.) wks., cwt	.80 - .85	.80 - .85	.80 - .85
Sulphide, fused, 60-62%, dr., lb	.02¾- .03½	.02¾- .03	.02¾- .03
Sulphite, crys., bbl., lb	.02¼- .02½	.02¼- .02½	.02¼- .02½
Sulphur, crude at mine, bulk, ton	18.00 -......	18.00 -......	18.00 -......
Chloride, dr., lb	.03½- .04	.03½- .04	.03½- .04
Dioxide, cyl., lb	.07 - .08	.06½- .08	.07 - .07½
Flour, bag, cwt	1.60 - 3.00	1.60 - 3.00	1.60 - 3.00
Tin Oxide, bbl., lb	.54 -......	.55 -......	.51 -......
Crystals, bbl., lb	.37½-......	.38 -......	.37 -......
Zinc. chloride, gran., bbl., lb	.05 - .06	.05 - .06	.05 - .06
Carbonate, bbl., lb	.09 - .11	.09 - .11	.09 - .11
Cyanide, dr., lb	.36 - .38	.36 - .38	.36½- .38
Dust, bbl., lb	.079- .07	.07 - .07	.069- .07
Zinc oxide, lead free, bag., lb	.05¼-......	.05¼-......	.056-......
5% lead sulphate, bags, lb	.05¾-......	.05¾-......	.04 -......
Sulphate, bbl., cwt	2.65 - 3.00	2.65 - 3.00	2.65 - 3.00

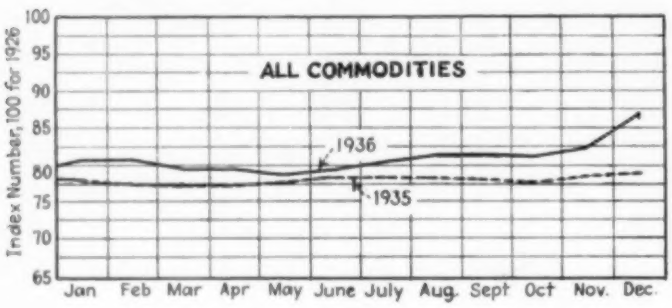
Oils and Fats

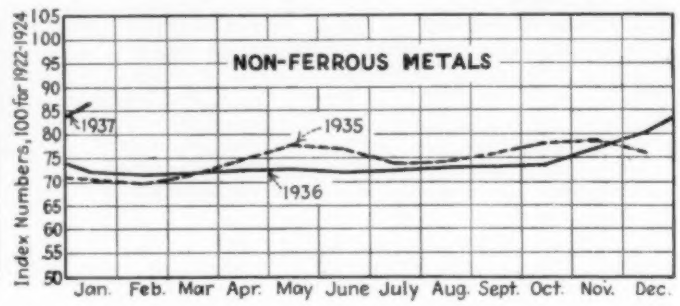
	Current Price	Last Month	Last Year
Castor oil, No. 3, bbl., lb	$0.10½-$0.11	$0.10½-$0.11	$0.10 -$0.11
Chinawood oil, bbl., lb	.15½-......	.15 -......	.14½-......
Coconut oil, Ceylon, tanks, N. Y. lb	.08¾-......	.09½-......	.05 -......
Corn oil crude, tanks, (f.o.b. mill), lb	.10¼-......	.10¼-......	.09½-......
Cottonseed oil. crude (f.o.b. mill), tanks, lb	.10 -......	.10½-......	.08¾-......
Linseed oil, raw car lots, bbl., lb	.099-......	.101-......	.098-......
Palm, casks, lb	.06½-......	.06½-......	.04¾-......
Peanut oil, crude, tanks (mill), lb	.10½-......	.09½-......	.09 -......
Rapeseed oil, refined, bbl., gal	.85 -......	.85 -......	.55 -......
Soya bean, tank, lb	.10 -......	.10 -......	.08½-......
Sulphur (olive foots), bbl., lb	.11½-......	.10¼-......	.08½-......
Cod, Newfoundland, bbl. gal	.42 -......	.48 -......	.35 -......
Menhaden, light pressed, bbl., lb	.084-......	.078-......	.072-......
Crude, tanks (f.o.b.factory), gal	.37 -......	.35 -......	.36 -......
Grease, yellow, loose, lb	.08½-......	.08¾-......	.05 -......
Oleo stearine, lb	.10¼-......	.12 -......	.08¾-......
Red oil, distilled, d.p. bbl., lb	.10½-......	.10½-......	.09¾-......
Tallow extra, loose, lb	.08¾-......	.09¼-......	.06½-......

CHEM. & MET.'S WEIGHTED PRICE INDEXES









Coal-Tar Products

	Current Price	Last Month	Last Year
Alpha-napthol, crude, bbl., lb	$0.60 -$0.65	$0.60 -$0.65	$0.60 -$0.62
Refined, bbl., lb	.80 - .85	.80 - .85	.80 - .85
Alpha-napthylamine, bbl., lb	.32 - .34	.32 - .34	.32 - .34
Aniline oil, drums, extra, lb	.15 - .16	.15 - .16	.14½- .15
Aniline salts, bbl., lb	.24 - .25	.24 - .25	.24 - .52
Benzaldehyde, U.S.P., dr., lb	1.10 - 1.25	1.10 - 1.25	1.10 - 1.25
Benzidine base, bbl., lb	.65 - .67	.65 - .67	.65 - .67
Benzoic acid, U.S.P., kgs., lb	.48 - .52	.48 - .52	.48 - .52
Benzyl chloride, tech., dr., lb	.30 - .35	.30 - .35	.30 - .35
Benzol, 90%, tanks, works, gal	.16 - .18	.16 - .18	.15 - .16
Beta-napthol, tech., drums, lb	.23 - .24	.23 - .24	.22 - .24
Cresol, U.S.P., dr., lb	.10 - .11	.10 - .11	.11 - .11½
Cresylic acid, 99%, dr., wks., gal	.73 - .75	.73 - .75	.51 - .52
Diethylaniline, dr., lb	.55 - .58	.55 - .58	.55 - .58
Dinitrophenol, bbl., lb	.29 - .30	.29 - .30	.29 - .30
Dinitrotoluen, bbl., lb	.16 - .17	.16 - .17	.16 - .17
Dip oil, 25%, dr., gal	.23 - .25	.23 - .25	.23 - .25
Diphenylamine, bbl., lb	.38 - .40	.38 - .40	.38 - .40
H-acid, bbl., lb	.65 - .70	.65 - .70	.65 - .70
Naphthalene, flake, bbl., lb	.07½- .07¾	.07½- .07¾	.07 - .08
Nitrobenzene, dr., lb	.08½- .09	.08½- .09	.08½- .10
Para-nitraniline, bbl., lb	.45 - .47	.45 - .47	.51 - .55
Phenol, U.S.P., drums, lb	.13½- .14	.13½- .14	.14½- .15
Picric acid, bbl., lb	.30 - .40	.30 - .40	.30 - .40
Pyridine, dr., gal	1.10 - 1.15	1.10 - 1.15	1.10 - 1.15
Resorcinal, tech., kegs, lb	.65 - .70	.65 - .70	.65 - .70
Salicylic acid, tech., bbl., lb	.40 - .42	.40 - .42	.40 - .42
Solvent naptha, w.w., tanks, gal	.26 -......	.26 -......	.26 -......
Tolidine, bbl., lb	.88 - .90	.88 - .90	.88 - .90
Toluene, tanks, works, gal	.30 -......	.30 -......	.30 -......
Xylene, com., tanks, gal	.30 -......	.30 -......	.30 -......

Miscellaneous

	Current Price	Last Month	Last Year
Barytes, grid., white, bbl., ton	$22.00-$25.00	$22.00-$25.00	$22.00-$25.00
Casein, tech., bbl., lb	.19 - .20½	.19½- .20½	.15 - .16
China clay, dom., f.o.b. mine, ton	8.00 -20.00	8.00 -20.00	8.00 -20.00
Dry colors:			
Carbon gas, black (wks.), lb	.04 - .20	.04 - .20	.04 - .20
Prussian blue, bbl., lb	.37 - .38	.37 - .38	.37 - .38
Ultramarine blue, bbl., lb	.10 - .26	.10 - .26	.10 - .26
Chrome green, bbl., lb	.26 - .27	.26 - .27	.26 - .27
Carmine red, tins, lb	4.00 - 4.40	4.00 - 4.40	4.00 - 4.40
Para toner, lb	.75 - .80	.75 - .80	.80 - .85
Vermilion, English, bbl., lb	1.72 - 1.75	1.69 - 1.72	1.59 - 1.60
Chrome yellow, C. P., bbl., lb	.13 - .14	.13 - .14	.12 - .14
Feldspar, No. 1 (f.o.b. N.C.), ton	6.50 - 7.50	6.50 - 7.50	6.50 - 7.50
Graphite, Ceylon, lump, bbl., lb	.07 - .08½	.07 - .08½	.07 - .08½
Gum copal Congo, bags, lb	.09 - .10	.09 - .10	.09 - .10
Manila, bags, lb	.09 - .10	.09 - .10	.16 - .17
Damar, Batavia, cases, lb	.13½- .16	.13½- .16	.15½- .16
Kauri No. 1 cases, lb	.19 - .25	.19 - .25	.20 - .25
Kieselguhr (f.o.b. N. Y.), ton	50.00 -55.00	50.00 -55.00	50.00 -55.00
Magnesite, calc, ton	50.00 -......	50.00 -......	50.00 -......
Pumice stone, lump, bbl., lb	.05 - .07	.05 - .08	.05 - .07
Imported, casks, lb	.03 - .40	.03 - .40	.03 - .35
Rosin, H., bbl	10.80 -......	11.85 -......	5.65 -......
Turpentine, gal	.47 -......	.49 -......	.49½-......
Shellac, orange, fine, bags, lb	.25 -......	.25 -......	.27 -......
Bleached, bonedry, bags, lb	.21 -......	.19½-......	.24½-......
T. N. bags, lb	.14 -......	.14 -......	.14 -......
Soapstone (f.o.b. Vt.), bags, ton	10.00 -12.00	10.00 -12.00	10.00 -12.00
Talc, 200 mesh (f.o.b. Vt.), ton	8.00 - 8.50	8.00 - 8.50	8.00 - 8.50
300 mesh (f.o.b. Ga.), ton	7.50 -10.00	7.50 -10.00	7.50 -11.00
225 mesh (f.o.b. N. Y.), ton	13.75 -......	13.75 -......	13.75 -......

INDUSTRIAL NOTES

Compressed Industrial Gases, Inc., Chicago, which has been a holding company for nine subsidiary companies has now become an operating company having dropped the names of the subsidiaries.

The Ironton Fire Brick Co., Ironton, Ohio, has appointed Interstate Supply Co., Milwaukee, as its sales representative in Wisconsin.

Armstrong Cork Products Co., Lancaster, Pa., has opened new district offices in Washington, D. C., and Los Angeles and San Francisco, Calif.

Koppers Co., Pittsburgh, has appointed Stanley N. Brown and Robert M. McClintic as assistants to the president of the company.

Crane Packing Co., Chicago, has moved its office in Houston, Texas to 1303 Capitol St. Roy Blackbird is manager of the southwest territory.

Audubon Wire Cloth Corp., Philadelphia, has appointed R. L. Regester its sales representative in Pittsburgh, Pa., with headquarters at 6823 Thomas Blvd.

Foote Bros. Gear & Machine Corp., Chicago, announces the appointment of H. F. Edge & Co., 987 Cox Ave., Atlanta, Ga., as district representative in the southeastern territory.

Crane Co., Chicago, has opened two new sales districts, the east central and the southeastern, with C. S. Pitkin and J. G. Johns in charge respectively.

Ajax Flexible Coupling Co., Westfield, N. Y., has opened a sales office in the Starks Bldg., Louisville, Ky., with Alfred Halliday in charge.

Westvaco Chlorine Products Corp., So. Charleston, W. Va., has acquired the California Chemical Co. on the Pacific Coast.

American Cyanamid & Chemical Corp., New York, has acquired the business and chemical plant of Chas. H. Stone, Inc., at Charlotte, N. C.

New CONSTRUCTION

Where Plants Are Being Built in Process Industries

	Current Projects		Cumulative 1937	
	Proposed Work	Contracts	Proposed Work	Contracts
New England..........	....	....	$40,000	....
Middle Atlantic........	$40,000	$930,000	7,117,000	$966,000
South..................	1,000,000	476,000	40,000	16,000,000
Middle West...........	40,000	1,855,000	1,080,000	1,914,000
West of Mississippi.....	40 000	1,000,000	1,230,000	1,760,000
Far West...............	125,000	253,000	2,800,000	1,903,000
Canada.................	2,800,000	40,000	130,000	....
Total..............	$4,045,000	$4,554,000	$12,437,000	$22,543,000

PROPOSED WORK

BIDS ASKED

Chemical Plant—California Chemical Co., Newark, Calif., and Westwaco Chlorine Products Corp., 405 Lexington Ave., New York, N. Y., plans to construct a chemical plant at Newark, Calif. Estimated cost $1,000,000.

Creosoting Plant—Dougherty Lumber Co., Thomas Dougherty, Pres. and Treas., 1053 East 152nd St., Cleveland, O., contemplates the construction of a creosoting plant and dry kiln, at 4300 East 68th St., Cleveland. Estimated cost $40,000.

Gasoline Plant—Pepper Gasoline Co., Enid, Okla., plans to construct a 2 unit natural gasoline plant at 50th and Lincoln Sts., Oklahoma City, Okla. Estimated cost $50,000.

Gasoline Plant—Phillips Petroleum Co., Bartlesville, Okla., plans to construct two gasoline absorbers at the 27th St. pumping station, Oklahoma City, Okla. Estimated cost, $30,000.

Gas Plant—City, c/o City Clerk, City Hall, Chicopee, Mass., contemplates the construction of a gas plant. Estimated cost will exceed $40,000.

Oil Products Plant—National Oil Products Co., C. P. Gulick, Pres., Harrison, N. J., has acquired the plant of the United States Finishing Co., at Cedartown, Ga., and will alter and improve same for its own use. Estimated cost $1,000,000.

Oil Refinery—Skelly Oil Co., Cunningham, Kan., plans repairs and alterations to its refinery. Estimated cost $45,000.

Paper Mill—Syndicate c/o Robert Livingston, Engr., 70 Pine St., New York, N. Y., plans to construct a paper mill in the vicinity of Jacksonville, Fla.

Pulp Mill—Soundview Pulp Co., Everett, Wash., plans to construct the third unit of its pulp mill. Estimated cost $1,300,000.

Vegetable Oil Products Plant—Santa Cruz Oil Co., J. J. Coney, Vice Pres., 311 California St., San Francisco, Calif., plans to construct a vegetable oil products plant at the foot of Mulberry St., Alameda, Calif. Estimated cost $500,000.

CONTRACTS AWARDED

Distillery—American Distillery Co., Sausalito, Calif., has awarded the contract for additions to its distillery to C. A. Immel, 24 Catalpa Ave., Mill Valley, Calif. Estimated cost $50,000.

Distillery—United Distilleries, 2700 Willmarco Ave., Baltimore, Md., has awarded the contract for alterations and additions to its distillery to J. J. Gebhart, 3403 Calloway Ave., Baltimore. Estimated cost $50,000.

Factory—Casein Co. of America, Inc., 9 Johnson St., Bainbridge, N. Y., has awarded the contract for a 3 story factory to Frank Lewis & Sons, Bainbridge, N. Y. Estimated cost $45,000.

Factory—E. I. du Pont de Nemours & Co., Linden Ave., South San Francisco, Calif., has awarded the contract for an addition to its factory to Cahill Bros., 206 Sansome St., San Francisco. Estimated cost $50,000.

Factory—Linde Air Products Co., 205 East 42nd St., New York, N. Y., has awarded the contract for the construction of a factory on Buckeye St., Toledo, O., to John W. Cowper Co., 775 Main St., Buffalo, N. Y. Estimated cost $65,000.

Factory—National Adhesives Corp., 1940 Carroll Ave., Chicago, Ill., has awarded the contract for the construction of a factory to Wigton-Abbott Corp., 143 Liberty St., New York, N. Y. Estimated cost $150,000.

Factory—National Aniline & Chemical Corp., Abbott Rd., Buffalo, N. Y., has awarded the contract for two factory additions to Metzger Construction Corp., 429 Carlton St., Buffalo.

Factory—National Carbon Co., West 117th St. and Madison Ave., Cleveland, O., has awarded the contract for the construction of a factory at Columbia, Tenn., to Gillmore-Carmichael-Olson Co., 1873 East 55th St., Cleveland, O. Estimated cost $100,000.

Factory—National Carbon Co., West 117th St. and Madison Ave., Cleveland, O., has awarded the contract for the construction of a factory at Clarksburg, W. Va., to H. K. Ferguson Co., Hanna Bldg., Cleveland, O. Estimated cost $100,000.

Factory—Pioneer Flintkote Co., 5500 South Alameda St., Vernon, Calif., has awarded the contract for factory to C. L. Peck, H. W. Hellman Bldg., Los Angeles. Estimated cost $75,000.

Factory—U. S. Gypsum Co., 816 West 5th St., Los Angeles, Calif., awarded the contract for the construction of a paper and felt mill at 8430 Quartz Ave., South Gate, Calif., to Myers Bros., 3407 San Fernando Rd., Los Angeles. Estimated cost $78,000.

Factory—Yardley of London, Inc., 620 Fifth Ave., New York, N. Y., perfume manufacturers, has awarded the contract for a factory at Union City, N. J., to Wigton-Abbott Corp., 143 Liberty St., New York, N. Y. Estimated cost $100,000.

Glass Factory—Glenshaw Glass Co., Glenshaw, Pa., has awarded the contract for the construction of a bottle plant to Pittsburgh Industrial Engineering Co., 3939 Butler St., Pittsburgh, Pa. Estimated cost $40,000.

Glass Factory—Kimball Glass Co., 1440 Bway., New York, N. Y., has awarded the contract for the construction of a factory at Vineland, N. J., to Frank J. Larkin Construction Co., Architects Bldg., Philadelphia, Pa. Estimated cost $200,000.

Glass Factory—Maryland Glass Corp., Mt. Winans, Md., has awarded the contract for the construction of a factory to Engineering Contracting Corp., North and Linden Aves., Baltimore, Md. Estimated cost $25,000.

Glass Factory—U. S. Glass Co., Tiffin, O., plans to recondition its glass furnaces. Work will be done by day labor and separate contracts.

Kiln—Colonial Insulator Co., 973 Grant St., Akron, O., has awarded the contract for the construction of a kiln to Allied Engineering Co., 4150 East 56th St., Cleveland. Estimated cost $35,000.

Kiln—Locke Insulator Co., Charles and Cromwell Sts., Baltimore, Md., has awarded the contract for the construction of a kiln to Carl W. Schmidt, Munsey Bldg., Baltimore, Md. Estimated cost $50,000.

Laboratory—American Rolling Mill Co., Middletown, O., has awarded the contract for the construction of a laboratory at Hamilton, O., to T. W. Allsworth, Hamilton. Estimated cost $200,000.

Laboratory—Bell Telephone Laboratories, Inc., 463 West St., New York, N. Y., has awarded the contract for Radio Laboratory 17 at Deal, N. J., to James Sutherland, Inc., 222 Main St., Asbury Park, N. J. Estimated cost including equipment $40,000.

Laboratory—Merck & Co., Lincoln Ave., Rahway, N. J., has awarded the contract for a 2 story, 50x105 ft. addition to its laboratory to Walter Kidde Constructors, Inc., 140 Cedar St., New York, N. Y.

Laboratory—Standard Oil Co. of New Jersey, Elizabeth, N. J., has awarded the contract for an addition to its laboratory in the Bayway section of Linden, N. J., to Austin Co., 19 Rector St., New York, N. Y. Estimated cost $170,000.

Oil Refinery—Barnsdall Oil & Refining Co., Corpus Christi, Tex., will construct an oil refinery along the ship canal in the vicinity of Corpus Christi. Work will be done by separate contracts. Those interested should communicate with owners now. Estimated cost $1,000,000.

Oil Refinery—Schluderberg-Knidle Co., Baltimore and Eaton Sts., Baltimore, Md., has awarded the contract for the construction of an oil refinery to E. Eywing & Sons Co., 808 South Conkling St., Baltimore, Md. Estimated cost $50,000.

Refinery—Dixie Refining Co., c/o W. W. Tait, Inc., Union Guardian Bldg., Detroit, Mich., has awarded the contract for the construction of a refinery at Trenton, Mich., to Arthur G. McKee & Co., Cleveland, O. Estimated cost $1,000,000.

Paper Plant—Eddy Paper Co., Three Rivers, Mich., has awarded the contract for an addition to its plant to Miller-Davis Co., Kalamazoo, Mich. Estimated cost $100,000.

Paper Mill—Howard Smith Paper Mills Ltd., 407 McGill St., Montreal, Que., Can., has awarded the contract for an addition to its mill to A. J. Byers & Co., Ltd., 1226 University Ave., Montreal. Estimated cost $40,000.

Pottery Plant—Trenton Potteries Co., 309 North Clinton Ave., Trenton, N. J., has awarded the contract for alterations and additions to its plant to Fowler-Thorne Co., 211 North Montgomery St., Trenton.

Rayon Mill—American Yarn & Processing Co., Mount Holly, N. C., has awarded separate contracts for an addition to Woodlawn Mill. Estimated cost $40,000.

Roofing Factory—Flintkote Co., Poland and Galvey Sts., New Orleans, La., has awarded the contract for factory to H. T. Makopsky, New Orleans, $35,998.

Tire Factory—Goodyear Tire & Rubber Co., Akron, O., has awarded the contract for the construction of a factory at Gadsden, Ala., to The Austin Co., 16112 Euclid Ave., Cleveland. Estimated cost $200,000.

Tire Factory—Goodyear Tire & Rubber Co., Jackson, Mich., has awarded the contract for the construction of a factory to The Austin Co., 16112 Euclid Ave., Cleveland. Estimated cost $230,000.

Warehouse—Gulf Refining Co., 5000 15th St., Detroit, Mich., has awarded the contract for the construction of a warehouse to Ora E. Williams-Miller Co., 2411 14th St., Detroit. Estimated cost $35,000.

Warehouse—Olean Glass Co., Inc., Third and Reed Sts., Olean, N. Y., has awarded the contract for the construction of a warehouse to F. T. Coughlin, 230 North Third St., Olean, N. Y. Estimated cost $40,000.

Average Prices for Chemicals And Oils Lower Last Year

WITH a large part of heavy chemicals sold on a contract basis last year at price levels which were on a par with the quotations for the preceding year, a certain amount of stability was given and the average of values did not go through any wide fluctuation. The net change for the year was in favor of a lower level with the weighted index number registering at 86.63 as against an average of 87.42 for the preceding year. Hence the price trend for chemicals has been downward since 1933. The decline in the 1936 average might be discounted to a certain extent by the fact that the actual sales prices—sulphuric acid for instance—were somewhat higher in 1936 than they were in 1935 with no change in the openly quoted schedules.

One of the most important price factors in the latter part of the year was the passage of the Robinson-Patman Bill. When this measure became operative, different manufacturers of chemical products extended the scope for quotations which had applied only to special contract buyers and thus increased the volume of sales at inside prices with no compensating rise for small lot business.

The solvent branch of the chemical industry was, perhaps, the weakest from a consideration of values with lower sales schedules running throughout practically that entire division. On the up side of the market the metal salts were stronger as a class following the trend in values for the basic raw materials.

Among the products for which net declines were reported in 1936 were acetone, citric and tartaric acids, alcohols, acetates, and formaldehyde. Among those which held net advances were ammonium sulphate, nitrate of soda, copper sulphate, basic carbonate of lead, lead oxides, glycerine, bichromates, tin salts, and casein. The sodium phosphate group also was in a better position inasmuch as the very low prices at which some business for 1935 delivery was accepted, were not repeated.

In the naval stores industry, turpentine held an erratic course without much net gain whereas rosins more than doubled in value during the year.

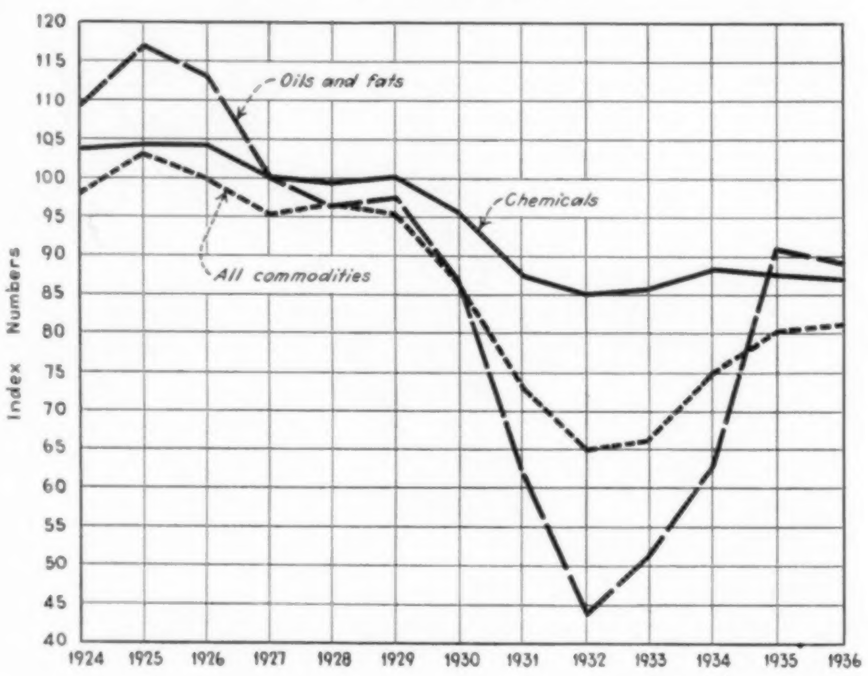
Glycerine at times held a nominal position with scarcity of offerings restricting trading in the spot market and frequently premiums over the quoted price were paid in order to secure material for prompt or nearby shipment. The shortage in glycerine did not originate during the last year but has existed for some time and the outlook for the new year was not bright from the basis of supply.

Toward the end of the year the price trend for oils and fats was upward. In fact some of the oils were commanding higher prices in 1936 than they did in 1935 but the weighted average for the year was lower. As a matter of fact both 1935 and 1936 show an average price level higher than that for any year since 1929. With the taxation—import and excise—to which oils have been subjected a high price level becomes necessary. In the case of coconut oil and other oils which are imported from the Far East, the interruption to deliveries caused by labor troubles in shipping circles, an upward swing to values was the natural result of curtailing supplies. This, however, was a temporary factor and as soon as shipments and consumer stocks reach a normal level, coconut oil may be expected to assume a position dictated by its usual parity.

Yearly Indexes of Prices
(12-month average)

	Chemicals	Oils and Fats	All Commodities
1924.......	103.88	109.31	98.1
1925.......	104.41	117.12	103.5
1926.......	104.42	112.98	100.0
1927.......	100.00	100.00	95.4
1928.......	99.51	96.43	96.7
1929.......	100.10	97.55	95.3
1930.......	95.78	86.62	86.4
1931.......	87.61	61.90	73.0
1932.......	85.00	43.60	64.9
1933.......	85.58	51.48	66.0
1934.......	88.12	63.14	75.0
1935.......	87.42	91.50	80.0
1936.......	86.63	89.14	80.7

Average Monthly Price Indexes—1924 - 1936



CHEM. & MET.
Weighted Index of CHEMICAL PRICES

Base = 100 for 1927

This month......................	87.19
Last month......................	87.26
February, 1936..................	87.21
February, 1935..................	87.53

Some adjustments have taken place in the price schedules for certain chemicals—acetic acid and anhydride for instance—but they largely were an offset. Sulphate of ammonia was advanced at the beginning of the month and pure methanol lowered. Turpentine was easy but made some recovery from the lowest level.

CHEM. & MET.
Weighted Index of Prices for OILS AND FATS

Base = 100 for 1927

This month......................	104.60
Last month......................	109.35
February, 1936..................	91.29
February, 1935..................	90.94

The price movement was not one sided but the majority of changes during the last month was downward and the weighted index was sharply lower. Prices favored buyers on crude cottonseed, linseed, China wood and coconut oils as well as on animal fats but fish oils, and glycerine were higher.